THE

MONTHLY AMERICAN JOURNAL

OF

GEOLOGY

AND NATURAL SCIENCE.

VOL. I. PHILADELPHIA, OCTOBER, 1831. No. 4.

AN EPITOME OF THE PROGRESS OF NATURAL SCIENCE.

(*Continued from page* 104.)

WE have seen how truly science and arts may be said to have been cradled in ancient Greece. The Romans received them late; they were amongst the other fruits of their conquests, and they retained them but a short time; two centuries of intellectual splendour being all they can boast of. Victory, and its attendants, riches and luxury, corrupted the Roman people; the ancient simple national spirit fled, barbarians filled the ranks of their armies, and thus the glory of their name, and the integrity of their wide possessions, were left to the protection of strangers. Then came the contests for supreme power, amongst the Roman leaders, and the successful ambition of Cæsar, who ceased to be a Roman when he triumphed over the liberties of his country. Fatigued with civil dissentions, and the bloody proscriptions that had almost extinguished the class of pre-eminent citizens, those who remained, were glad to take shelter under the protection of one, who had once been their companion and equal, and who, to the military renown he had acquired, united the greater security of a highly cultivated mind. That vigilance for the public welfare, which had been the common duty of all, had now devolved upon one, and to him, the source of honour and power, all consecrated those energies, which belonged to their country. Adulation took the place of patriotism. This base spirit arose to a fearful height, under his successors, Augustus and Tiberius. Panegyric alone was permitted in Rome: the eloquence which has truth for its object, was unknown, both to the forum and the

senate. The want of great living examples of excellence, finally degraded the public mind. We have the complete proof in the Attic Nights of Aulus Gellius,* of the decline of Roman letters. Sulpicius Apollinarius, whom he extols, boasted of being the only one who could comprehend the history of Sallust, who died not quite one hundred and seventy years before. So insensible had the Romans become to the beauty and force of their ancient language. The other individuals, of whom Gellius speaks, are obscure orators and grammarians, and the work itself has nothing in common with the sublime spirit of thought, which distinguishes most of the writings of the older Romans: indeed, the men of this day, appear to have almost lost sight of the pre-eminent citizens who had preceded them. It is true, there were still regular schools of philosophy in Rome, which had their disciples and their disputations. Plutarch† was of this period, and was much honoured of the emperor Trajan, who appointed him governor of Illyricum; but Plutarch was a Greek, and his protector was one of the superior men of his time. The only school which enjoyed much reputation at this period, was the Eclectic school. Plotinus‡ and Porphyry, who flourished somewhat later, were of this school.

Whilst Roman literature was thus passing away, the multiplicity of laws, inseparable from the constant changes of their masters, were favourable to Roman jurisprudence, which continued to flourish. Nevertheless, those distinguished jurists, Papinian and Ulpian, became victims to the irreverent violence of the times. The first was assassinated by order of Caracalla,§ the second was murdered by the Prætorian guards,‖ whilst under the immediate protection of the emperor Alexander Severus. The confusion attendant upon these anarchical times, was greatly increased by the bloody persecutions the Christians underwent, which only terminated by the accession of Constantine to the throne, who, having embraced the Christian religion, took them publicly under his protection.¶ Low as the state of Roman intellect was at this time, by his removal of the seat of empire to Byzantium, the ancient capital of Thrace,** he accelerated its total ruin, as well as that of the empire. The removal of the whole machine of government, drew along with it nearly all the

* A. D. 130. † Died A. D. 140. ‡ Died A. D. 270. § A. D. 212.
‖ A. D. 226. ¶ A. D. 319. ** A. D. 328.

rank and wealth of Rome. Courtiers, generals, magistrates, counsellors, ministers, all these, with their households, their slaves, their wealth; the artists, manufacturers, and merchants, who depended upon them, all abandoned Italy. The public revenue, too, being no longer collected and expended in Rome, a void was left there which was deeply felt for five centuries.

Whilst by this great movement, the total ruin of Roman letters was perpetrated, a new literature, which had been growing into importance, during the controversies of two centuries, attained its height under this emperor. This literature arose in the conflict which the first Christian writers had to maintain with the champions of the dominant religions; but it reached its meridian at a later period, when the field of controversy was in the very bosom of Christianity. It was in the schools and libraries of Egypt, Persia, Palestine, and Africa, those great polemics were nursed, who were the glory of the fourth century. Arnobius, Lactantius, Eusebius, Athanasius, Hilary, Basil, the Gregory's, Ambrose, Jerome, Augustin, and Chrysostom.* Unlike the miserable sophists from amongst their countrymen, who had assisted to produce the general debasement, these illustrious men, known as the Fathers of the Christian church, were distinguished as much for their profound views of moral conduct, as for their Christian zeal, and unrivalled erudition. St. Augustine, whose writings are dear to every true scholar, has not disdained, in his great work "De Civitate Dei," to hold up the writings of Cicero as models of human wisdom, although Cicero lived before Christianity was taught. Cicero's celebrated work, "De Republica," was principally known to us by the writings of Augustine, before the recent fortunate discovery of the mutilated original, by professor Mai, in the library of the Vatican. The voluminous and eloquent works of these fathers, have had the greatest influence upon succeeding times. It was unfortunate, however, for letters, that they became entirely obscured by theology. The numerous councils which were held, composed of the most eminent men from all civilized countries, extended the field of argumentation to the most distant points. Their decisions, which tended often to put doctrinal opinions into a still greater state of complication, and which constantly gave birth to new disputes,

* Died A. D. 407.

formed at length the all-absorbing subject of cultivated minds. Science was no more thought of; even jurisprudence but existed in the shade of the ecclesiastical code, and of canon law. Warmed and hurried on by contention, and the pride of opinion, they overlooked the divine character of the precepts of their faith, and too often preferred to look for God in obscure dogmas, and speculative reasonings. In his works they found him not; strangers to natural theology, nature appears to have existed in vain for them. In their search after truth, they went from the unknown to the known, the reverse of that true method, which experience at length has brought us to: for if the past fourteen centuries have disclosed any great truth to man, it is, that God is to be seen in his works, and that the human mind must seek for truth itself, by proceeding from the known to the unknown. To the extinction of all taste for ancient literature, followed the destruction of the superb pagan temples, and their libraries. Fanaticism completed what controversy had begun, and the physical power of the successful faith, was destructively directed against the magnificent monuments of the fallen pagan mythology, and against the ancient classical literature; as was repeated at a later day by Knox, and other ferocious reformers, when they prevailed against the hierarchy of the venerable catholic church. The destruction by fire, of the works of the ancient Greek and Latin writers, was not enough. At a later day, a more curious method was resorted to by the priests, of asserting their power over the fallen literature. Notwithstanding the general proscription of the pagan writers, and which had been carried so far as to induce the council of Carthage to forbid all bishops to read pagan authors, some copies of the most esteemed writers had been preserved: but as the religious poems of St. Gregory, the canticles of St. Augustine, and the effusions of other holy men, were now substituted,—as the habitual poetry of the day,—for the verses of Virgil, Anacreon, Bion, &c., and as the old material, papyrus, became scarce, and parchment was too expensive for many individuals, the contents of the ancient rolls were obliterated, and religious compositions substituted in their place. This practice became still more general in the seventh century, and subsequently to it, when papyrus ceased to be made, in consequence of the destruction of every thing connected with literature, by the Saracens. It was thus that professor Mai discovered the lost

republic of Cicero, written over one of the palimpsests in the Vatican.

The fatal consequences of the overthrow of the ancient literature, were soon obvious. The powerful minds of St. Augustine and his compeers, had been alimented, and had grown to maturity, by the writings of Plato, Homer, Sophocles, Cicero, Virgil. The springs being now dried up, the streams ceased to run, and the ancient barrenness prevailed. The periods of Constantine* and Theodosius† were never replaced; and the fifth century is as conspicuous for its imbecility, as the preceding one had been for its intelligence. Eumenius, an orator of the fourth century, said of Cornelius Fronton, the chief of a school of his day, and one of the panegyrists of Antoninus, 'Romanæ eloquentiæ, non secundum, sed alterum, decus;' that he was not the second, but the other ornament of Roman eloquence: meaning that he was equal to Cicero; a fatal proof of his own and of the general ignorance. At this time, the schools were filled with Greek sophists of the worst kind, and the Latin tongue was undergoing a corruption, by the general abasement of mind, and the influx of strangers from distant and barbarous regions, who were gradually becoming masters of the Empire.

Every thing seemed now preparing for the long night which was to fall upon the human mind. The oratorical art consisted in fulsome panegyrics, pronounced before the unblushing presence of the individual to be eulogized. The want of great actions, was supplied by extravagant adulation; the love of flattery was substituted for the love of glory, and of honest commendation. Statues were raised both at Rome and Athens, to a Greek sophist named Proérésius, the one at Rome bearing the inscription,

"Regina Rerum, Roma, Regi eloquentiæ,"

where the only merit belonging either to the man or to the verse, consists in the miserable attempt to substitute for the ancient Roman verse, four capital alliterations. Amongst the grammarians of this dull period, Macrobius‡ deserves to be spoken of with some respect, having in his Saturnalium Conviviorum, left us some agreeable dialogues, containing curious details concerning the mythology, poetry, and history of the ancients. It is Macrobius who has preserved to us that most eloquent passage from

* Died, A. D. 336. † Died, A. D. 394. ‡ Died, A. D. 415.

Cicero's Republic, Somnium Scipionis, perhaps the most splendid thing bequeathed to us by antiquity; where we see how elevated his ideas were, and at the same time how imperfect was his knowledge of astronomical philosophy; a branch of learning Cicero had derived from the Greeks, and which he has here treated of with a splendour of diction, that is inimitable. Towards the close of the fifth century, Marcianus Capella wrote a work of nine books, in a very degraded Latin, entitled the Nuptials of Philosophy and Mercury; in the which,—incidental to a supposed conversation of learned men on the celebration of the Saturnalia,—he treats of the seven sciences, as they were then called, Grammar, Dialectics, Rhetoric, Arithmetic, Geometry, Astronomy, and Music. The poetry of Italy, at this time, does not bear evidence of that extreme inattention to which Latin prose was rapidly falling a victim. The effort which composition requires, and the restraining of expressions within the law of quantity, kept Latin poetry, for a long time, free from the corruptions which had already entered into the prose. The Roman armies were filled with strangers and barbarians, who sought to make themselves understood, by affixing Latin terminations to the words of their rude languages; and the natives, anxious to conciliate the ferocious soldiery, at whose mercy they lay, gradually adopted the jargon, which thus became conventional. Under such circumstances, it requires very few generations, first to disfigure, and then to change a language. The grotesque departure of the corrupt Latin of the dark ages, from that of the Augustan age, and which preceded the modern Italian, is not more remarkable than the transition observable in the dialectical passage from the ancient Anglo-Saxon, to the modern English.

Amongst the poets of this day, the works of Claudian are still held in estimation: had he lived when men were familiar with great actions, he might have been a great poet; but the want of dignity in the subjects he has treated of, has been a great disadvantage to the purity of his language, and the melody of his verse, which are worthy of more refined times. Stilicho,—a successful general of the Emperor Theodosius* the Great, and of his son Honorius,—was the Mecænas of Claudian, who himself was a true friend to his patron; for he celebrated his exploits, wrote

* Died, A. D. 395.

against his enemies, and when he was disgraced by Honorius, he voluntarily retired from the world. Certainly, if great events alone are wanting to inspire writers, these were not wanting, but they were events rarely illustrated by examples of virtue: they arose out of the ruin of a corrupted empire; and nobleness of conduct, as well as the sympathy due to true dignity were wanting to them. The Roman Republic, a prey to the headstrong passions and misrule of a few sanguinary chieftians, (these rapidly and tragically removed by their own turbulent soldiery,) foreign and civil wars, the repeated invasions of the barbarians, the frightful desolations consequent upon them,* and the absence of the pristine Roman virtue and courage, these were the unhappy events presenting themselves to the Roman poets and historians; events least of all calculated to incite generous minds to perpetuate the remembrance, of what every Roman breast could not but revolt at. The Goth Odoacer, having dethroned the last of the western Emperors in the person of Augustulus in 475, was himself driven from the throne in 493 by the Ostrogoth Theodoric. This prince, who had been educated at Constantinople, was, to a certain extent, the protector of letters, although he had never been taught to sign his own name. The manner in which he signed his edicts, is characteristic of himself, and of the age in which he lived. The five first letters of his name were cut through a golden blade, and by drawing his pen through the openings, he produced the letters T, H, E, O, D. The venerable Cassiodorus, who obtained and never abused his confidence, was one of the wisest and best men of his time. Arts and letters were eminently favoured by him, himself, being a writer only second to Boethius, the accomplished author of a work, entitled, "De Consolatione Philosophiæ," written during his imprisonment. Boethius is the last of the Roman writers, now held in any estimation, and was barbarously and unjustly put to death, under the cruelest tortures, by Theodoric: in despite of the high reputation he had acquired, in a glorious reign of thirty years, by this act he has shown that he was intrinsically a barbarian.

Justinian, Emperor of the East, to deliver Italy from the power of the Ostrogoths, sent his general Belisarius there, who achieved

* Alaric and the Goths sacked Rome three days in 409. Pope Leo ransomed it from Attila and the Huns in 452. Six years afterwards Genseric and the Vandals sacked it during fourteen days; and in 475 Odoacer at the head of the Heruli, caused himself to be crowned king of Italy, in the city of Rome.

victories worthy of the ancient Roman renown. Muratori, in his annals of Italy, has shown, that although he had been treated with signal ingratitude by the Emperor, yet that he died honoured, and in possession of great wealth, in 566. The story of 'Date Obolum Belisario,' was an invention of a Greek writer of the twelfth century, named Tzetzes. Narses, the eunuch, finally wrested Italy from the Goths, who had ruled there sixty-four years; and after contending with the Germans and the Franks, whom the hope of booty had drawn into Italy, he died at the age of ninety-five years. The Longobards, another race of barbarians, had now descended into the north of Italy, not with a marauding force, but with their entire nation, aged and young. They established themselves from the Alps to Rome, and in their bloody contests with the Greeks and Franks, they reduced Italy to ruin, and deluged it with blood. Their iron reign lasted from the end of the sixth century, through the seventh, and the greater part of the eighth. During this period, individual safety was the only consideration with men; and whatever of human letters survived this storm, found shelter in the monasteries.

In these consecrated retreats, hallowed even in the eyes of barbarians,—with whom superstition asserts its influence most powerfully,—the wreck of civilization found a refuge. Here contemplative and pious minds, turning with horror from the universal desolation, sought an asylum. It is a remarkable circumstance in human history, that these monastic institutions, which had been so instrumental in the encouragement of that blind fanaticism to which the literature of antiquity had been delivered, should be the direct means of preserving it from total ruin. Every monastery had its library, consisting principally of the works of the fathers, and of the polemic writings which had abounded in the preceding times. To these, in many instances, were added the most celebrated works of the ancients, of which copies had been preserved from the general proscription. Before the art of printing was introduced, it was part of the daily duty of the noviciates, and of the monks, whose time was not devoted to other pursuits, to copy those held in the highest estimation. These copies were of great value, and the abbots were not indifferent to the pecuniary advantages they derived from this source. In the history of the monasteries of the middle ages, those who followed this occupation, were styled antiquaries, or

copyists. Cassiodorus, of whom we have before spoken, in his work "De Institut. Divin. Litter." expatiates upon the pleasure he found in this occupation. He enters into a great many curious details, by way of instruction to the monks in his favourite art. He himself furnished drawings for the embellishment of the manuscripts, which he caused to be carefully bound by able workmen. When more than ninety years old, he drew up a treatise on orthography for the use of the monks. Amidst the inestimable benefits which Christianity has conferred upon mankind, this atonement, which the monasteries made to letters for the destruction they formerly had brought upon them, is one, to the value of which, we cannot be insensible.

At Constantinople, the seat of government of the Eastern Empire, letters continued rapidly to decline. Under Justinian,* whose code is well known, Theology became the reigning passion; ecclesiastical literature absorbed the public attention, and words stood in the place of things. His ambition was to lead in theology as in legislation, and he was not scrupulous in substituting physical for moral arguments. At the expence of the lives of a hundred thousand of his subjects, he made war upon the Samaritans of Palestine, a sect so unsettled in their doctrines, that the Pagans considered them to be Jews, the Jews to be schismatics, and the Christians to be idolaters. The theological zeal of this emperor, carried him at length to such refinements in his speculations, that, like the pendulum, which when arrived at one extreme point, is only preparing to return to the other, his opinions oscillated over into heresy; but happily, whilst he was perparing to sustain his errors, by the same means he had used to propagate his orthodoxy, he died.

Pope Gregory the First,† one of the most learned men of his day, but charged with carrying his zeal against Paganism to lengths injurious to ancient literature, observes in one of his letters, (Book 7th, let. 30,) "That there was not in Constantinople, an individual capable of translating accurately from Greek to Latin, or from Latin to Greek."

Nothing could exceed the intellectual darkness that reigned over the greatest part of Europe, when Charlemagne, in 774, passed the Alps, and delivered Italy from the Lombards. At Pavia, he found Peter of Pisa, from whom he received his first

* Flourished, A. D. 540. † A. D. 590.

elementary instruction in grammar; by this means he was prepared for the study of the prevailing learning of the day, under the celebrated Englishman, Alcuin. When it has been stated of this emperor, that he knew not how to write, this is to be understood of his ignorance of the large Roman character. His native tongue, the Tudesque, or German, he was much attached to, and wrote it with ease; but when the large Roman character came again into use, he experienced a difficulty in acquiring it: he caused his signature, therefore, to be engraved upon the pommel of the hilt of his sword. With this he affixed his manual; and on signing, he was wont to say, "I have signed it with the hilt, I will maintain it with the point." Although this illustrious monarch sought, by his example, to render learning popular, yet, surrounded as he was by ecclesiastics, the prejudices against ancient literature still prevailed, and the encouragement which the emperor intended for general learning, was too much diverted to theology. The effort, therefore, to revive human learning, being ill-directed, became abortive, and before the end of the ninth century, Italy and France, torn to pieces by civil wars, were again plunged into anarchy and darkness. It was thus the brilliant period of Charlemagne passed over, without producing any real benefit to science; resembling the aurora borealis, which is not like the aurora of the east, the harbinger of immediate day.

Of the encouragement which learning received about these times from the Saracens, it is not important we should now speak. The caliph Almamon cultivated astronomy, and many other branches of science received a rapid developement from them. Their empire, however, fell to pieces in a comparatively short period. Learning, with them, had been, as with the ancient Romans, a fruit of their conquests. Plants which are raised from the seed, are surer to take root, and to resist the violence of storms, than those which are transplanted in full blossom. Europe, however, is indebted to the Saracens, for the arithmetical characters, and which it is probable, were derived by them from the Greeks.

The tenth century witnessed the continued successive and bloody struggles, for the ruins of the Carlovingian monarchy. The situation of the popes of Rome, who had to contend in turns with the Saracens from Sicily, the Germans, and their own sub-

jects, did not admit of their making any efforts towards enlightening mankind. It was in this last century, that Italy was annexed to the German empire by Otho, a connexion which, unfortunately, she has not yet been able to shake off.

The eleventh century opened upon Europe, at a period when rapine, anarchy, and ignorance, had scarce a lower degree to descend to. The extreme of desolation had overtaken civilized society, and no other movement was left to it, but a re-construction of its elements. It is accordingly this century which is signalized by the Italians, as the commencement of a general renovation; a period, when, from the chaos which succeeded to the ruins of human intelligence, new combinations began to be formed. Amongst the causes which operated powerfully upon the human mind, at this period of general instability of things, and which was well fitted to influence the universal debility of intellect, was the belief,—which had been inculcated through the interested fanaticism of the monks,—that the world was drawing to its end. The period fixed for this astounding event, and which was well calculated for an age abandoned by philosophy, and delivered up to the influence of credulity, was the termination of the tenth century. Men looked forward to the evening of the day, on which they believed the sun was to rise for the last time, either with a stupid indifference, or a sullen despair. Many had endowed the convents largely with their wealth, for masses for their own souls, and for those of their living descendants: the desolation which was to fall upon the whole of mankind at once, took away all the common motives which attach men to property. The most illustrious names, the most magnificent establishments, could no longer be valuable legacies to future generations; for at the conclusion of the thousandth year of the Christian era, all generations were to be destroyed. But when the awful moment, which had been awaited with such inexpressible agitation, had passed away amidst the accustomed benevolences of nature, when the glorious sun rose once more, and ushered in the first day of the eleventh century, men abandoned themselves to a grateful confidence in the permanence of nature, and returned to the gentler influences of hope, both for present and future happiness. The human mind, thus unexpectedly relieved from so deadly a weight, was in the right situation to follow those generous impulses which influence it, when untram-

melled by the chains of superstition, and thus became prepared, not only to receive the seeds of useful knowledge, but to cherish and exercise those Christian virtues, which are the true end of all knowledge. Another important occurrence also took place at this period. The house of Saxony became extinct in 1002, at the death of Otho the third, who died in Italy. From this moment the Italians began their struggle for freedom. When the general effort is to emancipate, and not to enslave mankind; when our success is only crowned by being shared with others, when the selfish principle is subdued as far as human weakness permits, then the conflicts with tyranny are truly ennobled, and the most generous sentiments give birth to the most heroic actions. This great moment, then, when the Italians began their contest for freedom, was that also of the beginning of the emancipation of the human mind in the western empire.

Before this era, letters had begun somewhat to revive in the east. During the eighth century, the sanguinary religious quarrels, between the image-worshippers and the Iconoclasts, had led to the destruction of many monuments, both of art and science; but in the ninth, Leo the Sixth, called the philosopher, somewhat revived the love of knowledge, by his example. He was succeeded in the tenth by Constantine Porphyrogenitus, a prince of singular attainments. The revolution, so favourable to letters, which had taken place amongst the Arabians, had in a great measure contributed to the revival of letters in Constantinople. These wild conquerors, fatigued with their own desolations, which had laid waste the schools of Alexandria and others, now entered, with the same zeal, upon the cultivation of the learning of antiquity. The ardour with which they sought to acquire it, taught the Greeks the value of their books, and from copying them for the use of their new customers, they learnt at length to admire them: schools were re-established, and letters and philosophy, were again encouraged. This state of things was further favoured by the schism of the Greek church, which brought the Latins into a constant controversy with that acute nation of sophists. The general tendency to an emancipation of opinions, was also augmented, towards the end of the eleventh century, by the first crusade, which led so many prominent men of the times far from their homes, and by bringing them into contact with such various nations and individuals, could not fail to rouse their

attention, to whatever bore upon the institutions or manners of their own country.

It was in the twelfth century, that a state of things arose in Italy which secured to the northern Italians that greatest of all blessings, self-government, and its concomitant advantages.—Grown wise by experience, the inhabitants of the cities of northern Italy, renounced their ferocious antipathies, and formed the celebrated league of Lombardy, against which that active monarch the emperor Frederic Barbarossa, could not prevail. After losing several formidable German armies, which he conducted into Italy, he was finally discomfited in the most signal manner, and was compelled to acknowledge their independence at the peace of Constance, in 1183. The new republics which had thus won their freedom, became distinct schools, where the ancient examples of Roman virtue and patriotism were taught. The science of government was studied, and every branch of knowledge cultivated. Universities were founded, public teachers were honoured, and thus learning, which at the separation of letters from religion, flourished, because it found a liberal home in free Greece; now, when twenty-five hundred years had elapsed, began to grow up in security, under the shade of the Tree of Italian Liberty.

In looking back upon the period thus hastily reviewed, of about one thousand years; we perceive, that natural science, with the exception of the indefatigable labours of Pliny the elder—labours more curious than learned—had been entirely lost sight of. His death was appropriate enough for a naturalist, being suffocated, A. D. 79, whilst observing an eruption at Mount Vesuvius.

However slight this sketch of so important a portion of history is, yet it did not appear proper to the writer of this epitome, to pass over so many ages without observation; ages too, not the less interesting, because their details are less familiarly known, by reason of their being less accessible. The writer will have utterly failed in his intention, if he shall not have interested some of his readers, and if he shall not have convinced all, that solid advances in natural science, cannot be effected, unless we proceed experimentally from the known to the unknown. If in this long period, no progress was made in natural science, it was because there were no experimentalists, and because the studies of men, for the causes assigned, were based

upon their own speculative imaginations; whilst nature, with her inexhaustible pages, remained a sealed book to them. We shall see, by and by, what bounds the human mind took, when the characters of that book began to be understood.

(*To be continued.*)

NOTICES OF BIG-BONE LICK,

Including the various explorations that have been made there, the animals to which the remains belong, and the quantity that has been found of each; with a particular account of the great collection of bones discovered in September, 1830. By WILLIAM COOPER, member of the Lyceum of Natural History of New York, of the Academy of Natural Sciences of Philadelphia, the Zoological Society of London, &c.

BIG-BONE LICK, so celebrated for the remains of unknown animals that have been found buried there, is situated in a small valley in Boone county, in the northern part of Kentucky, within two miles of the left bank of the Ohio, about half way down; eighty miles distant, northerly, from Lexington, and twenty south-westerly from Cincinnatti, in Ohio.

By licks are meant, in the western country, springy places, naturally affording salt, in search of which, the various species of herbivorous animals, both wild and domestic, resort to them in great numbers. At Big-bone Lick, the salt is deposited from numerous springs, rising through the soil over a surface of several acres. There are likewise several streams of fresh water, that enter the valley from different sides; and these uniting, form a small river, which, taking a southerly course, discharges itself at the distance of twelve miles, into the Ohio.

The quantity of fossil bones which appear to have been brought together at this place, and deposited within a very small area, is truly wonderful. An authentic account of all that have been found during the last ninety years, such as might enable us to make some estimate of the number of individuals, at least of the larger animals, whose remains were here intermingled, as well as to form some probable conjecture respecting the circumstances under which they perished, and to which they owe their assemblage in this spot, would be at this day most desirable to possess. But it is too late to hope for this. Quantities almost exceeding belief, and of which no record has been kept, have within that period been carried off, and dispersed, no one can now tell whither.

The present communication comprises such information as the writer has been able to glean, of the various explorers of this celebrated place; a notice of the animals which have been found here, and the quantity of remains of each; with a description of the ground and other attendant circumstances that can throw any light upon its theory. This must be, in several particulars, imperfect: and any person who may be in possession of authentic materials relative to this subject, is hereby invited to make them known, or to communicate them to some competent person for that purpose. It is only in this manner that we can expect to supply any of the numerous desiderata in the history of Big-bone Lick.

Chronological Notice of the Explorers of Big-bone Lick.

Longueil, a French officer, seems to have been the first who procured fossil bones at this place. They were brought to him from a morass near the Ohio, by some Indians who belonged to his party. This was in 1739.

Colonel George Croghan, on his passage down the Ohio, in 1765, stopped at Big-bone Lick, and is the first white man who is known to have visited it. His description of the place as it appeared at that time, will be found in another part of this memoir.

General William H. Harrison of Ohio, was there, and obtained many bones in 1795; and the French general Collaud, as nearly as I can ascertain, about the same period.

Dr. Goforth of Cincinnati, was the next. He made large excavations, and found a great quantity of bones, which was about the year 1804; the precise date I have not been able to learn.

He was succeeded by General Clark, the distinguished traveller, who was there in 1806.

The Western Museum Society of Cincinnati, have caused various examinations to be made for bones, and many more have been carried away by travellers and others, within the last twenty-five years.

The author, in company with Mr. I. Cozzens, made a journey to Big-bone Lick in the summer of 1828. We caused several excavations to be made, and collected every thing that seemed likely to add to our stock of information concerning the place.

After all these various explorations, Mr. Benjamin Finnell, who resides here, and had previously made considerable discove-

ries of bones, undertook another, so recently as the month of September, 1830. It proved one of the most successful that has ever been made.

His example encouraged Mr. William Bullock, now also of Kentucky, to undertake another search immediately after. Mr. Bullock likewise obtained a rich and valuable collection; since which all further operations have been forbidden by the present proprietors of the land.

These various collections will be more particularly noticed, as well as the materials now existing will enable me, when treating of the animals to which the bones respectively belong. But it is much to be regretted, that the intelligent men who have enjoyed the opportunities, have generally omitted to furnish such descriptions as would now be useful for our purpose. We possess no satisfactory account of what was discovered previous to the visit of General Clark; and of those, even, which he obtained, no sufficient description has yet been published. A small part is described by Cuvier in his great work; and a few have also been made known by Dr. Wistar. The remainder is still preserved in this country, and it is to be hoped we shall not be allowed to remain long ignorant of what it consists.

Extinct animals found here, and quantity of remains of each species.

The remains found at Big-bone Lick, belong partly to animals whose species is now extinct, and partly to others, still numerous within the United States territory. Our present inquiries relating principally to the former, the other will not be especially mentioned, except in the case of some which have been included among the cotemporaries of those more ancient quadrupeds. Of these the mastodon being the most extraordinary, and that which furnishes the greater portion, by far, of these remains, first deserves our attention.

1. Great Mastodon. (*Mastodon maximus*,* Cuvier.)

Such is the quantity of bones and teeth of this species of mastodon, that has been disinterred at Big-bone Lick, that although it is the most common of American fossil quadrupeds, and has been found in almost every part of the United States, yet all

* M. Cuvier having finally adopted this name, we shall make use of it, instead of that formerly given, M. giganteum. Vide Oss. Foss. ed. 3. ch. v. p. 527.

that have been discovered elsewhere, would not, united, equal the number obtained at this single locality.

Longueil and Croghan each took but five or six teeth and bones, being as much as their means of transportation at that time permitted.

General Harrison, as he informed several members of the Lyceum of Natural History, when in New York, about three years ago, procured as many as filled thirteen hogsheads, which were sent up the Ohio to Pittsburg; after which he never heard what became of them. General Collard, about the same time, obtained twenty-four pieces.

It is not to be presumed that these bones all belonged to the great mastodon; but I am induced to mention them here, on account of the probability that a majority of them did. In all the collections of bones made here, of which any precise account has been given, these always constitute the great mass. And this, unfortunately, is as much as is now known of all that was removed previous to the exploration made by Dr. Goforth.

Concerning this, our information is likewise very scanty. He states that he got of mastodons' teeth alone,* weighing from twelve to twenty pounds, "as many as a wagon and four horses could draw," besides which were many large tusks and bones, no doubt principally belonging to the same animal. A large part of this collection passed into the hands of Mr. William Bullock, so well known for the services he has rendered to natural history. Mr. Bullock, now residing in this country, I applied to him for information concerning them, when he favoured me with the following reply, dated Nov. 24, 1828.

"In regard to the fossil bones of which you request information, it is about twenty years since I purchased of Thomas Ashe, twelve cases of bones, which I afterwards discovered were collected by Dr. Goforth, a few years previous to the time I bought them. According to Ashe's account, who was present when many of them were collected, they were found several feet below the surface, and under the stratum of graminivorous bones, which you must have observed on the bank of the small river that passes near the spring.

"I had about twenty back teeth, exclusive of perhaps eight

* See his letter to Mr. Jefferson, published in Cramer's Ohio Navigator, 8th ed. pp. 260, 262.

or ten in different jaws, and about ten tusks, among which were those of three different animals. The greatest part of these bones is now in the museum of the college of surgeons in London. A beautiful specimen of the fore part of the head, with all the delicate nasal bones entire, is in the possession of professor Monroe, of Edinburgh; and the late Dr. Blake, an eminent dentist of Dublin, had from me a very interesting collection of teeth in various stages of growth and decomposition."

It will be perceived that the quantity here mentioned by Mr. Bullock is small, in comparison with that which Goforth,—of whose correctness there is no reason to doubt,—states to have been obtained by him. A great part of his collection, therefore, still remains to be accounted for.

The next considerable collection known to have been made here, was by General Clarke, at the instance of Mr. Jefferson. The bones were brought to Washington in 1807, where they were seen by Dr. S. L. Mitchill,* who published a brief notice of them in the eleventh volume of the Medical Repository. They were divided by Mr. Jefferson, according to Dr. Wistar, who selected them, between the American Philosophical Society, and the French Institute. Dr. Mitchill says, there were three parcels made, of which Mr. Jefferson reserved one for himself. However this may be, there are now very few fossil bones preserved at Charlottesville, and it is doubtful whether these are from Big-bone Lick.

Those sent to France are described by Cuvier. They consist of an upper and two under jaws with teeth, five detached teeth, a radius, tibia, and several bones of the feet.

The cabinet of the American Philosophical Society, contains of the mastodon, two or three portions of the cranium, one of them comprising a large part of the alveolar process of a tusk, fourteen or fifteen mutilated jaw bones, upper and under, containing teeth, and from animals of various ages, besides large tusks, and pieces of fossil ivory, in considerable quantity, several vertebræ, and a few bones of the feet. The origin of all these is not certainly known at present; but, though some may have been derived from other localities, it is most probable that the

* Whilst sending this sheet to the press, the Editor has received information of the death of this amiable and most eccentric individual. For forty years he has been a conspicuous friend to natural science, and for a great portion of that time he kept the flag of science waving in this country, when he almost stood alone.

majority consist of those discovered at Big-bone Lick, by General Clarke.

The western museum of Cincinnati, and Letton's museum in the same city, contain many relics of the mastodon, nearly all from Big-bone lick. Together there are not less than one hundred pieces, more than half being grinders, of three and more pairs of points. There is, however, in the latter museum, a lower jaw, which is remarkable for having both branches tolerably complete, though the teeth are wanting.

My researches at Big-bone Lick, procured me about seventy pieces, of which the most considerable were as follows:

Two large, and numerous small fragments of tusks, presumed of mastodon.

A small left lower jaw, with one molar tooth, of four points; being the anterior milk molar. This is from a very young individual, probably the youngest yet discovered, the first milk molar being scarcely at all worn.* I obtained likewise several other interesting portions, including teeth and bones, apparently all belonging to this small head.

Four other large portions of lower jaws, all different, but without teeth.

Thirty tolerably perfect separate molar teeth, besides large fragments of others.†

Seven vertebræ, mutilated, and several portions of ribs.

Two portions of scapulæ.

* The *Tetracaulodon* of the late justly lamented Dr. Godman, appears to me, after a careful examination of his specimen, to be another young individual, also of the common mastodon, but older than mine, the anterior milk molars having begun to fall, after having been used until they were worn down. I have stated my reasons for this opinion, in a paper on the dentary system of the mastodon, which I read to the Lyceum of Natural History, in April, 1830. It appears, however, from recent observations, that the lower tusks, which I suppose all of the species to have possessed in their youth, were in some instances permanent during the advanced age of the animal. But whether this was a sexual characteristic, or merely an individual case of anomaly, of which I have seen other curious examples, *I cannot recognize more than one species of mastodon, among the great quantity of their remains found in the United States, which have come under my observation, those just alluded to, included.*

We are happy to find that Mr. Cooper, who has given this subject so careful an examination, and who has had such rare opportunities of studying the dentition of these animals, agrees with us so thoroughly in the opinion we have always expressed on this subject. Vide Monthly American Journal of Geology, &c. Vol. I. No. 3, p. 141.
EDITOR.

† Among these I include one similar to the tooth, also from Big-bone Lick, described by Dr. Harlan, as having belonged to an extinct species of tapir. That it is a young mastodon's tooth, is evident, I think, from the milk teeth still remaining in the head on which the supposed genus tetracaulodon is founded, as well as from the small jaw above described.

Four humeri, much mutilated, three of them from the left side.

Upper extremity of ulna.

Five carpal, two metacarpal, and one phalangial bone of fore foot.

Large fragment of os innominatum.

Another, comprising the acetabulum.

Lower extremity of left femur.

Patella, tibia, epiphyses, gone.

Calcaneum.

Besides numerous fragments, not requiring especial notice, but like the rest, indicating, by their shattered condition, the violence they were exposed to, before their final deposition at this spot. Some appear to have been a little rubbed, but the broken edges are generally sharp, and the surfaces unscratched.

The bones discovered by Mr. Finnell, in September, 1830, form one of the most interesting series belonging to the mastodon, that has probably ever been assembled. Having taken notes of these, while exhibited in New York this summer, I am enabled to give the following descriptive catalogue, in which I have included such anatomical, and other observations, as appeared to be new or interesting. The first will naturally be

A head, more entire than any previously discovered here or elsewhere. It is still, however, too imperfect to enable me to complete the description of this important part, and it is especially to be regretted, that so much is wanting around the exterior opening of the nostrils, that we can derive no aid from it, in endeavouring to determine with certainty, from the structure of this part, whether or not the mastodon was furnished with a trunk. But enough remains to show, that it differed materially from the elephant's in form. It in fact bears more resemblance, in some respects, though totally different in others, to that of the rhinoceros, particularly in the nearly vertical elevation of the occiput, giving the skull the general form of a pyramid, of which the occiput is the base, and the alveolar processes the summit, there being a gradual and pretty regular slope from between these, nearly to the edge of the occiput. It is, however, much broader and flatter on the top, than in

either of these animals.* The following are the principal dimensions.†

	Feet.	In.
From the occiput to the end of the alveolar, from which a part is broken off, . . .	3.	
Breadth over the orbits, ...	1,	$7\frac{1}{2}$.
Girth lengthwise, ...	6,	2.
Girth at the occiput, ...	5,	$7\frac{3}{4}$.
Girth of the two alveoles of tusks at their origin,	3,	$8\frac{1}{2}$.
From the outside of the right anterior molar, to the outside of the left, ...	1,	$2\frac{1}{2}$.
From the outside of the right posterior, to the left,		$9\frac{1}{2}$.

One tusk was found fixed in the socket, and the fellow lying near it. They are quite round, slender, and very uniform in diameter throughout, as far as they remain, the ends of both being broken off. The anterior molars being gone, and the posterior, which have four pairs of points, being worn by use, show that the animal was quite adult; though from its small size, and the slenderness of the tusks, it was probably a female. The curve of the tusks forms nearly a semicircle. The longer one measures six feet six inches, with a diameter of five inches.

A large single tusk, which, when first found, was quite entire, though brittle from decay. It is very round, tapers gradually to the point, measures in length nine feet two inches, and in circumference at the root, twenty-three and a half inches. It is remarkable for its slightly sigmoid curve.

Eighteen pieces of tusks, from one and a half, to five feet long. These furnish some curious examples of dentition, from various causes. Some appear to have been worn at the point by use, during the life time of the animal, and still retain a high polish. One or two are laterally abraded, in such a manner as to present a perfect section.

A left upper jaw, with part of the socket of a tusk and one grinder.

* This "flatness of the cranium" was first observed by Messrs. Mitchill and Townsend. See their account of the mastodon found at Chester, May 1817, in Mitchill's Cuvier, App. p. 379.

† Owing to the artificial state in which this head is at present exhibited, it is no longer possible to trace the sutures, or describe the separate bones. The general form is nearly all that can be safely described. For the same reason, no figure is now given.

Left upper jaw, with part of socket of tusk, and two molars.

Right upper jaw, with one molar, and an empty socket.

Right upper jaw, with one molar, from a young individual.

Left upper jaw, with one molar, still younger.

Right upper jaw, with one molar, no empty socket, the enamel whitish.

Right and left lower maxillary bones, each with the posterior molar, which is a little worn, perhaps belonging to one jaw.

Chin of a young individual, with a short truncated beak, in which are the vestiges of sockets of caducous incisors, (similar to the tetracaulodon of Godman.) Part of the right branch remains, with a portion of the root of the anterior right molar.

Two other chins with remains of sockets of anterior molars.

Left lower maxillary, with the posterior molar, and an empty socket, and part of the chin.

Right and left lower maxillary bones, forming part of the same jaw. The right is tolerably perfect, and contains the penultimate and posterior molars, with the sockets of one or two others. The left consists only of the posterior half of the jaw, with the posterior molar, which in both is still partly buried in the ascending branch, showing that the individual was not perfectly adult.

Left lower maxillary bone of large size, with one molar, and an empty socket.

Left lower maxillary of a young individual, with two molars of six points, and a germ, also of six points, but entirely buried in the bone, which is fractured in such a manner, as to expose the germ. From this piece we learn how many molars with six points, the mastodon possessed. From young jaws formerly discovered, it was already known that there were two of four points; and the adult and aged specimens make it evident that there was but one of eight or ten points, on each side, above and below. This gives six on each side, or twenty-four in all, as the total number of molars. They were not, however, all in action at the same time. Probably not more than two at once, were in use at any one period of the animal's life, and finally, none but the posterior molar, with four or five pairs of points, and an irregular heel remained in the jaw.

Left lower maxillary, with one molar of six points, and an empty socket before and behind it.

Right lower maxillary, also with one molar, and two empty sockets.

Right lower maxillary, with only the large posterior molar remaining, and much worn, the sockets of the others obliterated: evidently an aged individual.

Right lower maxillary, with the posterior molar, enamel whitish. The enamel is generally, it must be observed, very dark coloured, and sometimes black.

Left lower maxillary, with two molars of six points, posterior half of the jaw wanting. A young individual.*

Seventy-two molar teeth, presenting examples of nearly all the changes they undergo, from the state of a mere germ, of which the mastoid points alone remain, to that of an old and worn out tooth, in which the roots are completely ossified, and remain uninjured; while the crowns are worn down in such a manner, as to leave the bony substance of the tooth bare of enamel, which merely forms a border round the crown.

Of these molar teeth there are of the various kinds,

One with two pairs of points, and an odd shoulder, representing a fifth point, or possibly an indistinct pair.

Thirty-nine, with three pairs of points.

Fourteen, with four pairs of points, and an odd one. Of these ten belong to the upper jaw, and four, I think, to the lower.

Fifteen with five pairs of points, and an odd one, or heel.—These are all lower jaw teeth, the posterior molar.

Two with four pairs, and three small knobs in a row, besides a heel, and lateral tubercular knobs, and

One with five pairs of points, and two knobs, too irregularly placed to form a pair. These three last are also lower posterior molars.

Five atlas bones, with thirty-one other vertebræ, cervical, dorsal and lumbar. A separate spinal process, though incomplete, is twenty inches long; most of them are very much

* Of the fifteen portions of lower jaws here enumerated, the posterior molar remained in eight. In two of these this tooth had four pairs of points, and an odd point or heel, besides; in the six others, there were five pairs of points, with from one to three irregular knobs.

mutilated, and a part may not improbably belong to the elephant.

Fifteen ribs, more or less broken.

Large sacrum, with portions of ossa innominata attached.

Two portions of other sacra.

Five scapulæ, mutilated. Four retain the condyle.

Seven humeri, all mutilated, and very imperfect. One wants the epiphyses, being from a young and small animal. Another consists merely of the condyles, others are no more than the shaft of the bone, with both ends broken off.

Three ulnæ, of various sizes.

A radius, lower end broken off.

Fourteen or fifteen small bones of the fore feet, among which two cuneiform, and other carpal, and several metacarpal.

A very large and nearly entire os innominatum.

Two others, less entire, and appearing to belong together.

Three others, consisting of little more than the acetabulum, with the thyroid foramen.

A femur, nearly entire, thirty-eight inches long.

Four others, more mutilated, some of larger size than the preceding.

Five other considerable portions of the same bone.

A patella.

Very large tibia, twenty-nine inches long.

Three others, smaller.

Another, of a young individual, the epiphyses wanting.

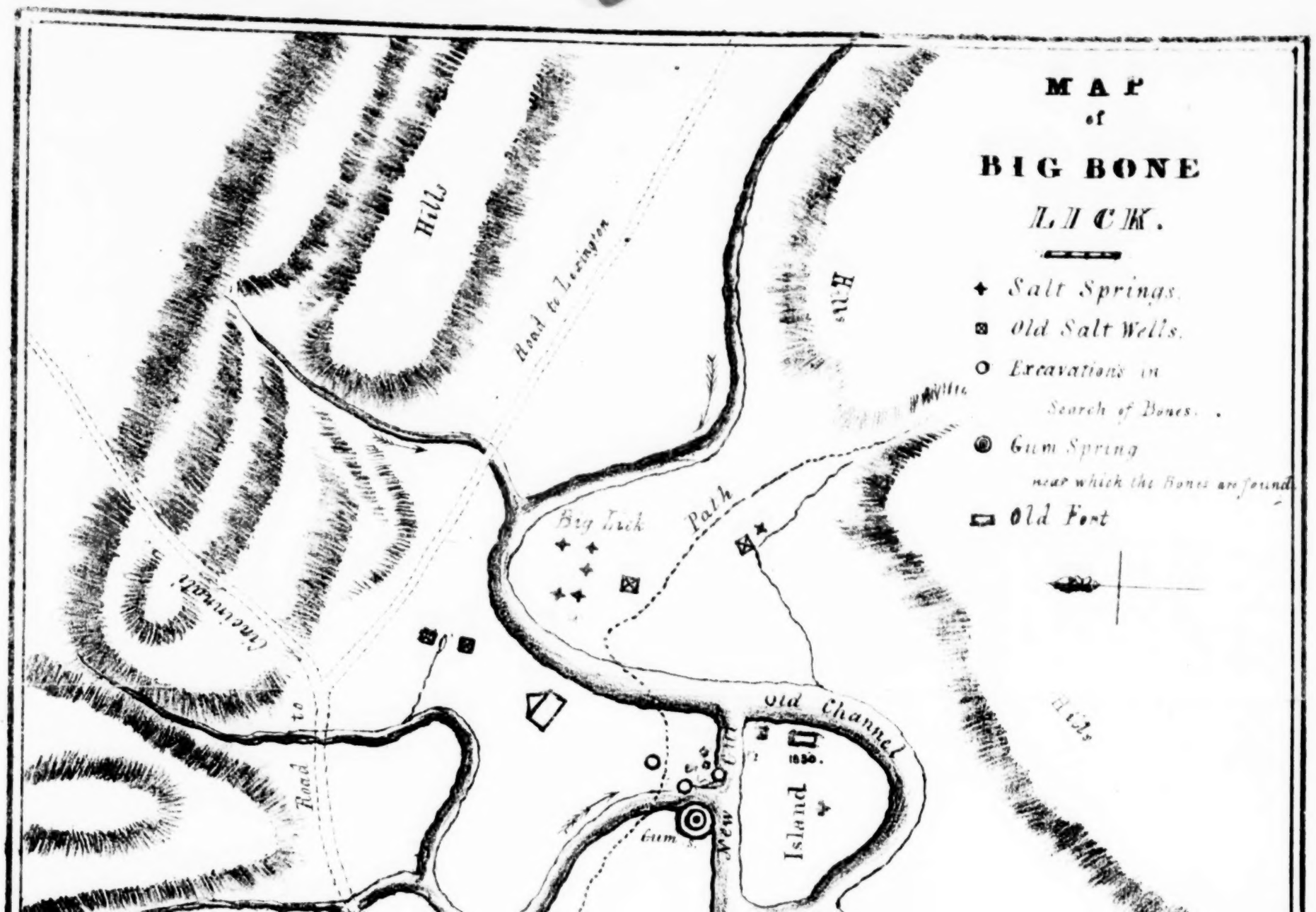
Two astragali.

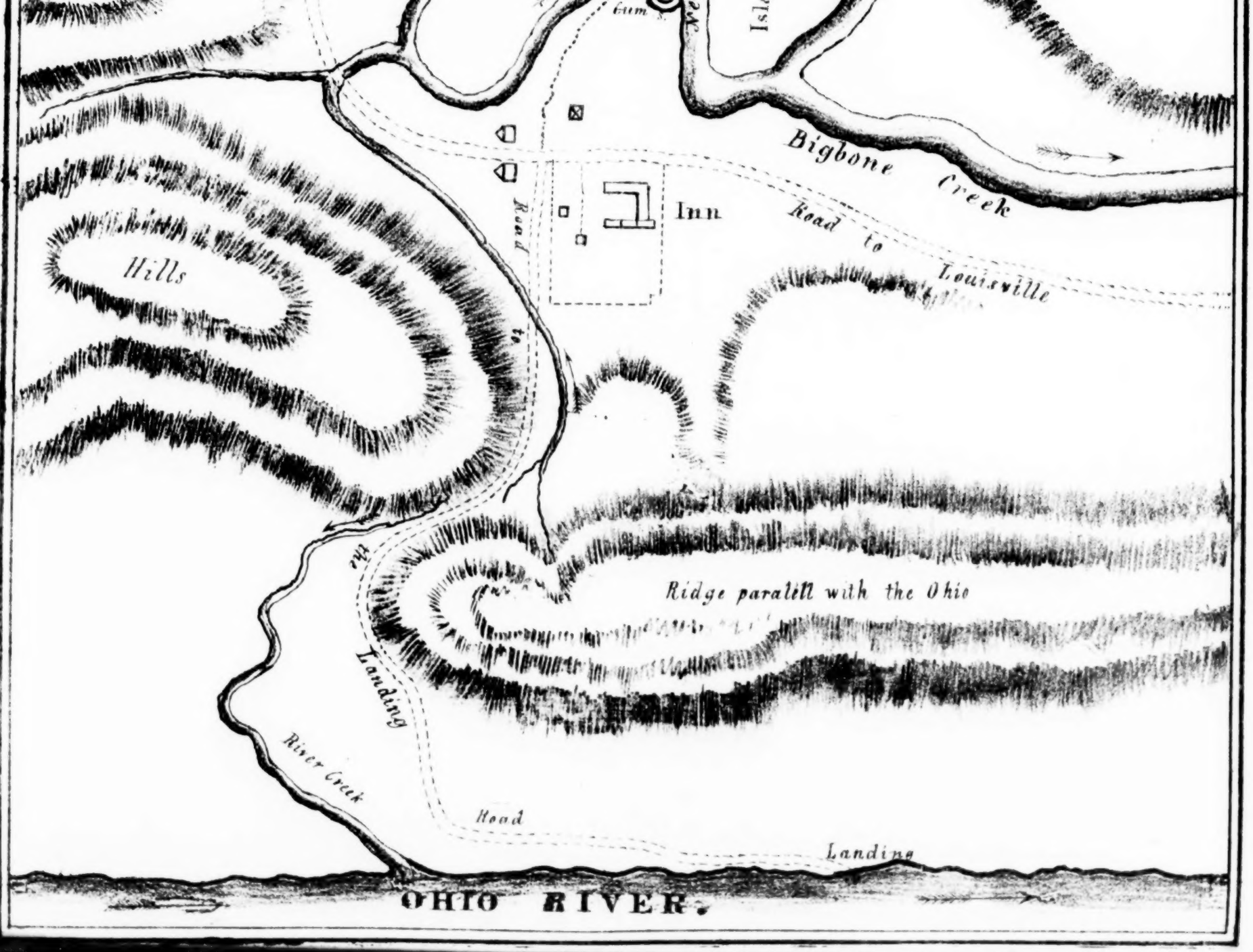
Four calcanea.

Immediately after Mr. Finnell discontinued, on procuring the bones just described, Mr. Bullock commenced digging near the same spot. He obtained many mastodon bones, as well as others; but as his collection has never been examined by any anatomist, I have not the means of ascertaining which, or how many there were, belonging to this animal. His letters to Mr. Featherstonhaugh mention, among others, "the ruins of a very large head, showing the interior structure in a very beautiful manner, with a large portion of the top of the skull."

II. Fossil Elephant. (*Elephas primigenius.* Blumenbach.)

Grinders belonging to a species of elephant, which, in the


MAP
of
BIG BONE
LICK.
Salt Springs.
Old Salt Wells.
Excavations in
Search of Bones.
Gum Spring
near which the Bones are found.
Old Fort
Hills
Road to Lexington
Big Lick Path
Old Channel
Island
Gum
Road to
Hills


Bigbone Creek
Inn
Road to Louisville
Hills
Ridge paralell with the Ohio
Landing
River Creek
Road
Landing
OHIO RIVER.

LIBRARY

opinion of M. Cuvier, do not differ essentially from those of the fossil Siberian, have always formed part of the collections made at Big-bone Lick. Until recently, they had always been found detached, and in small numbers.

It has been also stated that the elephant's teeth found here, were in a great state of decomposition; from which circumstance, and the absence of bones, it has been argued that they were of greater antiquity than the mastodon. But the facts are quite otherwise, as will presently appear.

Remains of elephants, there can be no doubt, formed part of those carried away from this place by General Harrison, and those who preceded him. But what portions, and how many, whether teeth or bones, or both, cannot now be determined. Turner, in 1797, indicated the teeth as different from those of the mastodon, though he did not know what animal they were from.

Goforth states, that he got many teeth of elephants, "some weighing 12lbs." besides tusks, that he supposed were elephants' which is very probable.

Governor Clark brought away several elephants' teeth. Three were sent to France, and most of the remainder are preserved in the cabinet of the American Philosophical Society. But they were all detached molars without any bone, except the lower jaw bones of a young individual mentioned by Wistar, which miscarried on their way from Washington to Philadelphia, and do not appear to have been ever recovered.

Many elephants' teeth, from Big-bone Lick, are shown in the public museum at Cincinnati. They are likewise separate teeth.

Among the teeth that I procured there in the year 1828, were four of elephant, all remarkably sound, and as free from decay as any teeth of mastodon I have ever seen, from Big-bone Lick or elsewhere. Indeed one of them, which was accidentally broke in getting, appears so fresh and sound within, that if I had not seen it taken out of the muddy stream myself, I might have been tempted to suspect some deception, like that mentioned by Cuvier, when a dealer tried to impose upon him by incrusting an African elephants' tooth with marl. Another is an anterior milk molar, like that seen in the head of the Asiatic elephant, figured by Cuvier, pl. IV. f. 5 *h*.

Among the remains disinterred in 1830, was an unusually

large proportion belonging to the fossil elephant. In the Finnell collection, I observed the following.

Two very large tusks, forming a pair. The longer, though part of the large end is broken off, still measures 11 feet 10½ inches in length, and 22 inches in circumference. What remains of the other, measures 8 feet 10 inches, the small end being wanting. Both these are very much curved upward, and a little outward, so as almost to form a complete circle. It is chiefly this peculiar curve, which is so commonly observed in the fossil elephant's tusks found in Europe and Siberia, that induces me to refer this pair to the elephant, of which several large heads, as will presently be seen, were found near where they lay.

Right upper maxillary bone of a large individual, with a large and perfect molar, and part of one side of the great socket of a tusk. The tusks just described may not improbably have belonged to this head; as well as the two next mentioned pieces.

Left upper maxillary, with a large molar tooth.

Large molar, with portions of left lower maxillary.

The greater part of the head of a young individual, comprising the jaws, both upper and under, with parts of the skull. The ascending branch is wanting from the left lower jaw, and is broken off in the right, but is preserved. In the upper jaws are two small molars which had been in use, and the same number below, besides a large germ buried in the right branch, which must have been concealed by the gum.

Twenty separate molar teeth, nearly all entire and undecayed.

An atlas, somewhat mutilated and rubbed, as if by rolling.

This is the only bone in the collection that I could determine to my satisfaction to belong to the Elephant. The more perfect large bones of the extremities appeared to be all mastodon's. The shafts of bones, without articulating surfaces, as well as the vertebræ, which are much broken, may have been in part elephant. My opportunities for comparison were not sufficient to enable me to determine this.

The collection formed at the same time, and in the same spot almost, by Mr. Bullock, is likewise very rich in remains of the elephant. In a letter to Mr. Featherstonhaugh, he states, that he commenced digging immediately after Mr. Finnell discon-

tinued, "and on the third day came to a very fine entire (or nearly so,) head of what I suppose to be the Siberian elephant, four feet long, having all the teeth and one tusk in it. It is the finest fossil I have ever seen, and the only one known except that at St. Petersburgh.

Megalonyx. Jefferson. Cuvier.

It was not until recently that any discovery of remains of this animal was known to have been made, besides those dug out of a cave in Virginia, about thirty-five years ago, and described by Mr. Jefferson, in the American Philosophical Transactions.* From the description given by Goforth, of the bones he found at Big-bone Lick, afterwards carried to England, there was reason to suspect, that among them there was some belonging to the megalonyx. But Mr. Bullock states, that there were none among those which came into his possession. The great claw mentioned in Ashe's account, he says, in a letter to Mr. Featherstonhaugh, was no more than a scapula of some animal, filed down to this shape. Until my journey to Ohio, in 1828, I had no positive information of the megalonyx having been found, except in the one instance, above referred to.

Messrs. Drake and Mansfield, in their "Description of Cincinnati, in 1826," mention "bones of the megalonyx," preserved in the Western museum, in that city. Some of these I saw there, and was informed that they had been obtained by Mr. J. D. Clifford, from the White cave, in Kentucky. Besides these, I found in the same museum, a large humerus of megalonyx, discovered at Big-bone Lick, during one of the searches made there, by order of the proprietors.

Mr. Cozzens and myself found also a metacarpal bone at the same place, no doubt belonging to the megalonyx. This bone, with all those in the Cincinnati collection, have been described

* Although caverns are extremely numerous in the limestone region of the United States, and have been often explored in search of nitrous earth, well authenticated instances of fossil bones found in them, are very rare. The following paragraph is extracted from "*A description of Big-bone Cave, in White county, Tennessee, by D. T. Maddox, Esq. Aug.* 17, 1813," contained in an almanac published in the western country.

"My guide now informed me, that in this apartment had been found bones of a remarkable size and figure. He said, they had dug up the talon of a lion, thirteen inches long, the hoof of an elephant, the ribs of the mammoth, and the skull of a giant; but that they were all destroyed."

The "talon of a lion," here mentioned, may have been an ungueal phalanx, or even a claw, of a megalonyx.

and figured by Dr. Harlan, in the Journal of the Academy of Natural Sciences of Philadelphia.

Two additional instances of the occurrence of these remains were thus determined.

Among those found by Mr. Finnell in 1830, are the following portions of the skeleton of a megalonyx.

A right lower maxillary bone, with four molar teeth.* One of these, the anterior molar, is broken in the middle, and the upper half lost. The bone itself is so much mutilated, that barely enough remains to retain the teeth together, showing the violent action it was exposed to, before being buried.

A detached molar tooth in very good preservation. It differs from all the four in the above described jaw, but not so much but that we may easily believe it to be from the upper jaw of the same animal.

A clavicle, probably of the same.

A tibia, of the right side.

In Mr. Bullock's letter to Mr. Featherstonhaugh, already quoted, he gives a sketch of a bone, of which he obtained four similar, during his late search. They are evidently the ungueal phalanges of a megalonyx.

In the description of the megalonyx by Dr. Harlan, above referred to, he has pointed out some differences in the teeth and bones discovered in the United States, which he considers as indicating two species of this genus. But the scanty materials we up to this time possess, do not, in my opinion, authorise us to decide upon specific characters. With respect to the teeth in particular, it is evidently fallacious to rely too much upon slight differences in them, inasmuch as we now see in the jaw lately discovered, that no two of the four are precisely alike, and the first and fourth, are, in fact, as dissimilar in the outline of their crowns, as possible.

Remains of the megalonyx have also been found in South America. They were brought from Brazil, and placed in the collection of Munich, by the travellers, Martins and Spix. A late writer,† in the Annals of Philosophy, is therefore incorrect, in saying that they have occurred only between the parallels of

* Vide Pl. 3, Vol. I. No. 2, Monthly American Journal of Geology, &c.
† Vid. Ferussac Bull. May 1829, p. 275.

30° and 40° N. lat.* From an account recently published by Dr. Wagner, it appears that the Brazilian megalonyx was like many of the remains hitherto discovered in North America, also found in a cave.

Bos Bombifrons. Harlan.

This extinct species, peculiar, so far as is yet known, to this country, was first distinguished, and its characters pointed out, by the late Dr. Wistar of Philadelphia,† in a paper read to the American Philosophical Society, accompanied with a good figure, in 1817 or 1818.

Cuvier, as late as the third edition of his great work, makes no mention of it, although, unlike the three fossil species enumerated by him, it has the advantage of being so well distinguished from all the living species as to be in no danger of being confounded with any of them. Dr. Harlan first assigned it a place in the system under the expressive name of *Bos bombifrons.*‡

The head described by Wistar was obtained at Big-bone Lick by governor Clark, and is preserved in the Philosophical Society's Cabinet.

In the Finnell collection, I found a second head of this species, much in the same state as that figured by Dr. Wistar, or if any thing, rather less complete. Placed by the side of an analogous specimen of the buffalo, in the same collection, the differences were strikingly obvious.

These two heads are the only remains that have been identified as belonging to this species. Dr. Harlan, however, mentions fossil teeth from Big-bone Lick that he thinks most probably belonged to the same.

Bos Pallasii. Dekay.

This species is now first introduced among those whose remains occur at Big-bone Lick. During my stay there in 1828, a mutilated skull, with part of the core of one horn attached, was found in one of the streams near the great spring, where it had been used as a stepping stone, and brought to me. It is now deposited in the Lyceum of Natural History.

A skull similar to this, which was thrown up by an earthquake near New Madrid on the Mississippi, in the year 1812, forms the

* Vid. Ann. Phil. for June 1831, p. 418.
† Vid. Amer. Phil. Trans. vol. 1. new series, p. 375.
‡ Fauna Amer. p. 271.

subject of a paper in the annals of the Lyceum, by my friend Dr. Dekay. On the supposition that it belonged to the same species with some Siberian heads described by Pallas and Ozcretskoosky, he proposes to call it *Bos Pallasii.* Their strong resemblance to the musk ox is admitted by Cuvier and Pallas, and it is equally apparent in the American specimens, of which I have seen a third, from Ohio, besides the two above mentioned. If they should finally prove to be identical with the *Bos moschatus* it would be rendered doubtful, whether they ought properly to be enumerated among the companions of the extinct races, whose remains are deposited at Big-bone Lick.

Kentucky appears to have been for ages the chosen habitation of many species of the bovine family. Besides the buffaloes, that within half a century abounded in that fertile country, we find at Big-bone the remains of two other species, while a fourth is proved to have formerly inhabited the same neighbourhood: the remarkable skull, a portion of which is preserved by the American Philosophical Society, was found within ten miles. It is the *Bos latifrons* of Dr. Harlan, which Cuvier compares with the aurochs, *Bos urus*, of the old continent.

Cervus Americanus. Harlan.

In the paper which we have several times had occasion to refer to, Dr. Wistar describes an imperfect skull of a species of Cervus, which he found among those brought from Big-bone Lick by general Clarke. A careful comparison of it with the two great species of this genus that now inhabit the United States, led him to conclude that it came from an animal different from both these, and larger than either. Dr. Harlan has also described it in his Fauna, with the name of *Cervus americanus.*

Among the smaller bones discovered in 1830 at Big-bone Lick, and since exhibited in this city, are several belonging to one or more species of deer. The greater part, I have no doubt, are recent bones, but among them is a skull so similar to that figured by Dr. Wistar, and, though very large, so different from that of either the moose or elk, that I did not hesitate to refer it to the extinct species. It is not more complete than Dr. Wistar's specimen, and bears the appearance of having been rolled. These are the only instances of the occurrence of this fossil with which I am acquainted.

[*To be Continued.*]

COMMUNICATION FROM THE PRESIDENT OF THE GEOLOGICAL SOCIETY OF LONDON, AND OTHER NATURALISTS.

The editor lays before his readers, with a just pride and entire satisfaction, the following communication, from the President of the Geological Society of London, and other distinguished Naturalists.

London, June 18, 1831.

My Dear Sir,—We, your undersigned friends in England, are happy to learn that you propose to establish a new periodical work in the United States, which, in embracing all subjects connected with the natural history of America, is to be specially devoted to the accumulation of geological facts and phenomena.

Knowing your zeal and ability, we have great hopes that a work so directed, will meet with every encouragement in your country, and we are certain that it cannot but be of service to the cause of science in general.

We shall at all times be desirous of aiding you with any communications in our power, and we subscribe ourselves,

Yours very faithfully,

Roderick Impey Murchison, *President of the Geological Society of London.*
Davies Gilbert, *Vice President Royal Society.*
W. D. Conybeare, F. R. S. F. G. S. &c.
A. Sedgewick, F. R. S. F. G. S. &c. *Fellow of Trinity College, Cambridge.*
Wm. Buckland, D. D. F. R. S. &c. &c. *Christ Church College, Oxford.*
George Bellas Greenough, F. R. S. &c. &c.
Charles Stokes, F. R. S. &c. &c.

P. S.—I cannot refrain in particular on my own part, from expressing the desire which I feel for the appearance of the proposed publication, as likely to conduce, in the most important points, to the effective progress of geology; to ascertain in detail the suite of formations, and the series of organic remains distinguishing them in a new continent, so widely separated from the old, and embracing such a range of various climate: so to compare the phenomena with those of Europe, has ever appeared to me the most material desideratum in geology; for we may be sure that any analogies which are common to localities geogra-

phically so distant, and placed under physical conditions so distinct, are, in truth, analogies belonging generally to the whole globe; and thus we shall obtain data adequate for the foundation of a general geological theory.

Well acquainted with the attention you have paid to the formations on this side the Atlantic, I am convinced that the execution of this task, cannot fall into more competent hands.

W. D. Conybeare.

To G. W. Featherstonhaugh, Esq.
Philadelphia.

ANTIQUITIES AND LANGUAGES OF THE MEXICAN INDIANS.

No. 2.—Mythology of the Mexicans.

It appears to be beyond controversy, that the gods of the Pagan mythology were cradled in Egypt. Inachus and Cecrops introduced the Egyptian divinities into Greece, and from Greece they passed to Rome, the mistress of the universe, and the slave of the deities worshipped by the people they had subdued. It is worthy of notice, that Moses, the legislator of the Jewish people, emigrated from Egypt to Palestine, where temples and ceremonies were established, to which some have altogether attributed an Egyptian origin.

Of all the opinions which hitherto have been declared on the subject of the first peopling of our American continent, one which appears the most reasonable, and which is contained within the limits of probability, is that which supposes the Asiatics to have been the first inhabitants of the new world. As it is not my intention to enter upon a question of this nature at present, I shall not allude to the reasons which have induced me to consider this as a well founded opinion, and shall confine myself to treating of the similarity which exists between the Egyptian and Mexican divinities.

If Dupuy and Volney had been acquainted with the mythology of the ancient Mexicans, their investigations respecting Egyptian physiognomy, would have received some aid from that of the Mexican deities. Fortunately, we have reached the age of analysis and comparison, when truth is divested of its shackles, and when conclusions established by the eyes of reason, are most accredited.

The aborigines of Mexico, believed in a supreme being, to whom they gave the name of *Teotl;* a term not far removed from the Greek word Theos, the name in that tongue for God.

To express the essence of the divinity, the Mexicans used the term *Ipalnemoani*, "he who exists through himself;" and also, *Tloquenahuaque*, "he who possesses every thing in himself." What difference is there between these ideas, and those which the Hebrews expressed by the word Jehovah? None! Let it be remembered that the cradle of Moses floated upon the waters of the Nile.

The Mexicans gave to the god of water, the name of *Tlaloc*, and the domain of the Mexican Neptune, they called *Tlalocan*. In *Mictla*, of which I treated in my former letter, the god *Mictlanteuctli* was adored, and the goddess *Mictlancihualt*. *Micila*, signifies hell. These were the Pluto and Proserpine of the Zapotecan Indians.

The tradition of a deluge, in which perished a great portion of the human race, is familiar to the Mexicans, who gave to the man who saved himself and his family in a canoe, the name of *Teocipactli*, and to his wife that of *Tochiquetzal*. The mountain upon which they landed was called *Colhuacan*: the name of this Mexican Ararat, is yet preserved in a village not far from Mexico. They had a tradition, that the language which had been lost in the deluge, had been taught to the survivors by a dove.

Ometeuctli is the Jupiter Stator of the Mexicans; and *Omecihuatl*, stands in the place of the Venus, of the Pagan mythology.

The sun was adored under the name of *Tonatiuh*, and the moon, by that of *Meztli*. These were the appellations of the pyramids, dedicated to them in the neighbourhood of *Teotihuacan*. The pyramids and the town still exist, and were visited by Humboldt: they were the sepulchres of the Aztecan monarchs. It is impossible to think of the worship to which they were devoted, the uses to which they were put, and especially to their architecture, without recalling to mind the pyramids of Egypt. Besides the pyramids, there were many other sepulchres in *Teotihuacan*. The dead were deposited there, seated with the symbols of their office, and with the emblems of their dignity. The conquerors found many riches in those cemetries. Cortez, in one of his letters, says, that his soldiers found in one of these sepulchres two hundred and forty ounces of gold. The Mexicans were not

acquainted with the art of preparing mummies: those of the Peruvians are well known in the United States.

The god *Quetzalcoatl*, was worshipped as the god of the air, throughout the Mexican empire, and his laws declared on the mountain Tzatzipec, the mountain of clamours; the voice of his high priest was supposed to be heard at a distance of three hundred miles. The Mexican Æolus was likewise their Saturn. They had their golden age, which they called *Teojihuitl*, or "the divine year." The same *Quetzatcoatl* was the vulcan of the Indians of Cholula, to whom he taught the art of smelting.

Centeotl, the goddess of maiz, whom the Mexicans also called *Tonacayohua*, "she who feeds us," and protects the fields like Ceres. To her they consecrated the first fruits.

Huitzilopochtli, or Mejitli, [the j pronounced as k,] from whence Mexico took its name, was the god of war, the Mars of the Mexicans.

Tacateuctli, the god who conducts, was the tutelary deity of commerce, the Aztecan Mercury.

Tezcatzoncatl, the god of wine, was not less a favourite with the Mexicans, than Bacchus was with the Egyptians. In the city of Mexico alone, were four hundred priests dedicated to his service.

Mijcoatl, the goddess of the chase, had, like Diana, her temples, as well as her Endymion, named *Amimitl*.

Coatlicué, or *Coatlanlona*, protected the gardens; the dealers in flowers celebrated the feast of this Flora of the Aztecans, in the spring of the year, in a temple called Topico.

Tzapotlatenan, the goddess of medicine, was the Mexican Apollo, though of a different sex. Besides their Venus the mother of the gods, they had their Venus impudica, and their Venus pronuba; the name of the first was *Macuiljochiquetzalli*. *Teopitoton*, smaller gods, were the penates, of which they had both noble and plebian. The Mexicans acknowledged as deities, the inventors of all the arts, and of useful acquirements. Polytheism was so fertile amongst the Mexicans, that it produced a goddess for the protection of ancient females, named *Slamateuchtli*. Not the deities alone, but the temples, the feasts, the priesthood, and every thing connected with the worship, has a remarkable affinity with Egypt.

The history of the aborigines of America, is yet involved in obscurity; perhaps this may be pierced in an age, when histori-

cal facts are sought by many, with as much avidity as gold was looked for in the fifteenth century.

I offer these notices and reflections for the consideration of those who are occupied in the important investigation of the origin and progress of the civilization of mankind. In another letter, I propose to speak of the extraordinary remains of *Palenque*, the Palmira of Mexico. I have the honour to remain, sir, with the most unfeigned respect, A MEXICAN.

ON THE METAMORPHOSIS OF THE YOUNG OF THE COMMON CRAB.

Extract from the Letter of a correspondent, dated London, June 18th, 1831.

"THE prodigious accession of new objects in natural history, especially from the animal kingdom, has placed great temptations in the way, both of young and old naturalists. Like those orators who contend for victory, and not for truth, there are too many individuals who are indifferent to the means by which they acquire their trophies. To have brought forward a new genus or a new species, and then cry, 'exegi monumentum,' if even the immortality does not promise a longer life than 'green peas,' has not been beneath the ambition of some minds, who can see in classification and nomenclature, the great end of all knowledge. Science, which has been somewhat fatigued by naturalists of this class, is now recovering from the dead weight they had become to it; but, like the tail of the tadpole, in its progress to maturity, they are becoming gradually absorbed. The voice of experience is at length listened to; we are already indifferent to conclusions, come they from what quarter they may, which are not obviously deduced from facts; and any man who pretends to belong to the multitudinous host of naturalists, which has sprung up in Europe,—as under the protection of Minerva, men were formerly produced from teeth, sown by Cadmus, in Bœotia,—must be very cautious—if he means to survive—how he skirmishes on his own account. These reflections, which grow out of the past and passing conduct of natural history with us here, may not be inapplicable to the United States, where a great deal of good sense, has to contend with inexperience, and no doubt with sciolism.

That natural history should flourish with you, in the United States, is sincerely to be desired; an additional bond will thus

unite two countries, where a common language can best express the progress of the general mind. There is much solicitude here, on the subject of the geology of your country; and you must perceive by the increase of natural history literature, how welcome every new fact will be to us, in any of its branches, from your side of the water. The appearance of your Journal, will, of course, be hailed here by all, and will be indulgently judged by your numerous friends. We are aware how arduous a task you have undertaken, and that but few, at present, will find leisure to assist you. But if you adopt a popular course, you will acquire the confidence of those able to strengthen you, and after a few months there will be no lack of useful correspondents and friends to your undertaking. This has been the career of all the periodicals of this country, which are distinguished for intelligence.

In a country like America, abounding with objects of natural history, the opportunities for indulging in neology, are very great: it is the vice of science. Your conchologists will tire of it, by and by, as others have done, and molluscous architecture,—a subordinate branch,—will become simplified and intelligible. They will be glad, as others have been, to condense their tedious lists, and shut them up into some prominent point, like those nice little nests of boxes we see sometimes. This is already going on in more important branches, and will be extensively done, ere long, in others. Mr. Thompson, author of the 'Zoological Researches and Illustrations in Natural History,' is carrying reform into the crustaceæ, and is showing that many of this class undergo changes, as they advance to maturity, quite as curious as those of insects. He has succeeded in hatching the eggs of the common crab, and the young, instead of being like their papa and mamma, turn out to be the zoéa, which had been raised to the rank of a genus of the modern systems by Bosc, who discovered it in the ocean. When we shall be able to extend this tadpolization to the rest of the decapodous crustacea, a great reformation will be effected in the rotten boroughs of natural history. Mr. Thompson remarks of the metamorphosis of the young crabs, that at the tender period, before any change, they are 'essentially and purely natatory animals, and, no doubt, possessed of corresponding habits, swimming about freely, and without intermission, in search of appropriate food. In their perfect state, the greater number can no longer avail themselves of the power

of swimming, but are furnished with pincers and feet, almost solely adapted to crawling, so that they are now under the necessity of confining their excursions in pursuit of prey, within more narrow limits. This curious piece of economy, explains what has ever appeared paradoxical to naturalists, viz. the annual peregrinations of the land crabs to the sea side; which, although acknowledged to be true, by several competent observers, could never before be satisfactorily accounted for."

FORCE OF VAPOUR.

Sir,—By publishing the following extract from Professor Silliman's Elements of Chemistry, and the subjoined notes, you will oblige A SUBSCRIBER.

IT is stated in Professor Sillman's Elements of Chemistry, pp. 87, 88, and 105, Vol. I. that "The force of vapour formed at the boiling point, is the same in all fluids, and just equals the pressure of the atmosphere, that is, thirty inches of mercury: this law *appears* to be fully established.

"It was also stated, in the same connexion, that the force of vapour is the same for every fluid, at an equal number of degrees above and below its boiling point. Both these laws were originally given on the authority of Mr. Dalton, which was sustained by that of other eminent philosophers. Dr. Turner, in the second edition of his chemistry, (third Amer. p. 61,) says, 'The force of vapour from all liquids is the same, at equal distances above or below the several temperatures at which they boil in the open air. Thus, steam at 200° F., has the same elasticity as the vapour of ether at 85°; the boiling point of the former being 212°, and of the latter, 97°: Biot and Amèdé Berthollet (Biot Traité de Ph. I. 282) have found that this law applies exactly to many other liquids; but some experiments on the oil of turpentine and petroleum, would lead to the conclusion that it was not universal.' Dr. Thompson (on heat and electricity, p. 222,) states, that by subsequent experiments, the second law of Mr. Dalton has not been found to hold good, and that it has been relinquished by its author. At the time when my statement of those laws was written and printed, neither the second English edition of Dr. Turner had appeared, nor the work of Dr. Thompson, nor the eleventh

edition of Henry,* in which the correction of the law is thus stated:

"'*The force of vapour from different liquids, varies at the same temperature,*'† and '*the variation of the force of vapour, from all liquids, is the same, for the same variation of temperature, reckoning from vapour of any given force;*' thus, measuring the force of all liquids at the boiling point, by thirty inches of mercury, it is found, that by losing 30° of heat from 212°, the vapour of water loses half its force, and so the vapour of any other liquid, loses half its force, by losing 30° of heat below its boiling point; and so on for any other increment or decrement of heat;‡ this has been experimentally established by Mr. Dalton."—[II. Vol. Addenda, p. 42.]

* Biot, in his Précis Elémentaire de Physique I. 265, a work published about six years before "the second English edition of Dr. Turner had appeared, or the work of Dr. Thompson, or the eleventh edition of Henry," has the following paragraph relative to this supposed law of Dalton:

"Les expériences que fit M. Dalton sur l'alcool, l'ammoniac, et la dissolution de muriate de chaux, lui parurent confirmer également la loi précédente. Toutefois, je dois prevenir que des observations postérieures, faites par divers physiciens, ont détruit l'idée de généraltié, et de rigueur qu'il lui avait attribuée. Le docteur Ure, de Glascow, a publié à ce sujet des recherches dont la précision parait ne guére laisser de doute, et un jeune et habile chimiste francais, M. Despretz, a été conduit par un autre voie aux memes consequences."

† Thus, if water, alcohol, and ether, be exposed to the temperature of 220°, the elasticities will be respectively 34.2, 80.2, 240, in inches of mercury.—True, but why does Mr. Silliman associate this fact with the law in question, as if it formed a part of the latter, and thus make Dr. Henry *appear* to confound things so essentially distinct?—Because the doctor happened to place them on the same page?

‡ Will Mr. Silliman inform us, in what respect the law thus corrected differs from that originally announced by Dalton? and if he admits, as we presume he will, that it differs in no respect, will he also inform us, whether he is speaking seriously or jocosely, when he first lamely *apologizes for admitting into his first volume, an incorrect law, and the next moment repeats identically the same law, with the assurance that it is a modification of the former?* If Mr. Silliman should be disposed to treat the matter seriously, we advise him to examine again the eleventh edition of his Henry; he will find that far from admitting the inaccuracy of the original law of Dalton, Henry does not even notice the fact of its truth having been disputed.

WALSH'S NOTICES OF BRAZIL.

We have selected the following extracts from that very amusing and instructive work, "Notices of Brazil, by the Rev. R. Walsh."

"In Brazil, all journeys are suspended at the Ave Maria, that is, the vespers to the Virgin, that commence after sunset. Instead of a curfew, this

period is announced in the country by a very simple and beautiful circumstance. A large beetle (Pelidnota testacea) with silver wings, then issues forth, and announces the hour of vespers, by winding his solemn and sonorous horn. The Brazilians consider that there is something sacred in this coincidence; that the insect is the herald of the Virgin, sent to announce the time of her prayer; and it is for that reason constantly called Escaravelho d'Ave Maria, or the Ave Maria beetle. On the hill of Santa Theresa, I have heard it of an evening, humming round the convent, and joining its harmonious bass to the sweet chant of the nuns within, at their evening service."—Vol. ii. ch. 2.

"The first place where gold was found, was at Riberäo, a small stream which falls into the Rio das Mortes, and here they built an Arayal, or village, called Antonio, near the spot where S. José was afterwards erected.

"The vicinity of this river every where attests the extensive search for gold formerly pursued here, as it was for a length of time considered one of the richest parts of Brazil, from the profusion of precious metal found on its surface. All the banks of the stream are furrowed out in the most extraordinary manner, so as to be altogether unaccountable to one unacquainted with the cause. The whole of the vegetable mould was washed away, and nothing remained but a red earth, cut into square channels, like troughs, with a narrow ridge interposed between them. Above was conducted a head stream of water, let down through these troughs, which were all on an inclined plane. The lighter parts of the clay were washed away, and the gold remained behind. When this has been collected by a process I will hereafter describe, that which remains behind is called pizaräo. It is an inert caput mortuum of stubborn sterility, which no process can afterwards endow with the principles of fertility; so that, in washing out the gold, all the riches of the soil were literally exhausted, and nothing left but a barren and utterly useless surface.

"The whole of the soil with which the soil is impregnated, is supposed to originate in the metalliferous ridges of rock which intersect the country. Here, in its matrix, the metal reposes; but the rains falling in impetuous torrents on their summits, and penetrating through their interior recesses, again ooze from their sides, carrying with them all the lighter parts of the precious metal, as they pass through the veins, and finally deposit them in the soil below, through which they percolate.

"As the great auriferous repertory of the country now stood before me, I was curious to explore it; so we prepared to ascend the ridge. The general face of it was quite perpendicular, and we could no more attempt to climb the part opposite to us, than Dover Cliff; but about three miles to the N. E. of the town, the ridge dips, and leaves a depression considerably lower than the rest, which is accessible. After winding in a zig zag direction up the rocky face, we at length emerged on the summit, and here we saw in perfection the totally new feature of the Brazilian landscape, which we before had contemplated at a distance. In all our journeys from Rio, for more than two hundred miles, we had scarcely seen a stone peeping through the soil. Here we stood upon an immense ridge of rocks, utterly denuded both of wood and grass, stretching their bare and rugged arms in all directions over the country, and forming a prospect strongly contrasted with any we had yet contemplated. This ridgy region, I was told, ramified through the country to an immense extent in a westerly direction, till it was lost in the mato grosso, or vast forests, which extend nearly to the Andes; and these are the great metallic repositories, from whence the whole subjacent soil of the Minas Geräes is impregnated with gold.

"The summit of the ridge was by far the most wild and solitary we had seen in Brazil. It was generally composed of white sand, strewed with nodules of very bright and almost transparent quartz, from the decomposition

of which the sand seemed to be formed. Piled up in great disorder were mounds of mica, slate, and large masses of different strata were lying over each other, in an angle considerably inclined, as if they had slipped down in succession from some more elevated place. Towards S. José, the face of the ridge was a perpendicular precipice, five or six hundred feet high, for twelve or fourteen miles; on the other side it descended in a more gradual slope, like a shed from a wall.

"The formation of this serra is generally of mica slate, and a modification of clay, talc, and chlorite slate. There is no granite yet discovered here; but a league and a half on the western side are extensive tracts of it. The beta, or vein, is generally quartz, in which is found gold variously mixed with iron stone, magnetic and titaneous iron, ochre, tellurium, and pyrites, containing gold and silver. The serra extends about twelve miles from east to west."

"We had every day, almost, a thunder storm, and the repercussion from the face of the ridge was so loud, sharp, and distinct, that it seemed as if the hard stone was hit and broken by a number of sledges striking upon it; and certainly if this symptom be any indication of metallic veins, it no where exists so strong as in the serra of S. José."

"For a long time, the only gold in the country was extracted from the clay, through which the rains from this ridge had filtered, leaving behind all the particles of the metal which they carried down. The first mines in the province were pits, called cata, opened by the workmen till they came to the cascalho, or gravel, below. This was broken up with pick-axes, and the contents brought to the river and washed. They were therefore opened as near the banks as possible, and were generally called taboleiros, from the flat tabular surface over them. These primitive workings are every where to be seen, and have given names to places, as Catas Altas.

"The next improvement was to conduct a stream of water to ground known to be impregnated with the metal, and so wash it out on the spot, and these were called lavras; they are seen in abundance on the banks of the Rio das Mortes.

"The third and last was pursuing the metal into the rock itself, and this they attempted by opening superficial trenchments, on the most horizontal surfaces, and pushing them on where they found any indication of gold. This they call talho alberto, or the open cut; and several of these remain in the serra towards S. João del Rey, about ten or twelve feet deep, ramifying in different directions, like the ravines of mountain torrents, which they resemble at first sight; but this, however, also failed, as the Brazilians had neither skill nor capital to proceed deeper, from the clumsiness and deficiency of their operations."

"The mines of Potosi were discovered by a Spaniard, who, in ascending the mountain, seized a bush to assist him; and this giving way, he found the root embossed with particles of silver. A similar circumstance is told of gold in this province. The first Paulistas pulled up tufts of grass in the same manner, and found numerous particles of gold entangled in the roots; and the first washings in search of the metal were from the roots of the herbage at the base of the hills.

"When a quantity of this impure mixture (grains of gold and esmeril) was thus collected, it was laid in the batea, (a bowl,) and here it was dexterously moved from side to side, in a constant ablution of fresh water, till the esmeril (oxide of iron) also passed off, and the heavier gold dust remained alone in the point of the cone. The whole of this was finally deposited in a large copper skillet, placed over a fire on the spot, and stirred till the water evaporated, and nothing remained but dry gold dust, in general of exceedingly minute particles, but frequently appearing in small globules, some as

large as a grain of small shot. In this state a magnet was passed through it, to which the particles of iron still mixed with the gold, adhered; and this was continued till the whole was abstracted.

"Sometimes a more scientific process is resorted to. The mixture of dust is put into a bowl, and two ounces of mercury added to two pounds of gold and oxyde. This mass is worked by the hands, into a dough, when the mercury takes up the gold only, which is merely entangled, but not amalgamated, with it. It is then put into a cloth, and a portion of the mercury squeezed out; the remainder is set in a brass vessel, over a fire, and covered with green leaves, which are removed as they become parched. They exhibit small globules of the sublimed mercury on the surface. What remains in the vessel is pure gold, changed in colour to a dull white."

"Our way next morning lay along the edge of one of the most extensive and richest lavras in the country, and from which the place derived its name of dourado or golden. Immediately outside the village is a very large and deep ravine, extending to a considerable distance, and exposing its bowels stained with bright red ochre. This is excavated in soft sand stone, of the consistence of hard clay, and is strongly impregnated with gold, which accumulates in caldeiros, or pits like caldrons. Large masses of gold are sometimes found in these caldeiros. They are indicated by fibres ramifying through the matrix in which they lie; and when pursued from different directions, they terminate in a common nucleus. A lump was found about thirty years ago in this place, which weighed forty pounds."—Vol. 2. ch. 5.

"A large topaz mine, of which our host was the proprietor, lay about a mile from the zancho, and the next morning we visited it. The regions through which we had passed, were generally clay mountains, or granite ridges; we had now entered a new formation, a soft schist of talk, clay, or mica slate, which every where presented its lamellated edges in the ridges, just above the soil. In some places it was hard and solid, as building slate; in others, it was soft and friable, and in various states of decomposition. About fifty years ago, in pushing a road through one of these soft schistic knolls, which stood in their way, they were astonished to see several crystals of topaz tumble out of the soft mass. On this discovery they began to search, and they have now found and opened three large mines in the neighbourhood, within a circle of ten or twelve miles. The mine of Capão do lana, is an immense circular quarry, the shape of a hollow inverted cone, whose upper circumference is a mile or more. The sloping sides are composed of talk, or mica slate, either green, grey, or blue, and in a state of such decomposition, as to be quite soft, hardly retaining any of its lamellated structure. This is called the corpo da formacäo, or the substance in which the topaz veins are formed. These veins are a white medullary mass, called massa branca, resembling soft chalk, though not calcareous, but is supposed to be some modification of mica. It forms cords as thick as an arm or leg, running for several yards, and ramifying into various smaller branches. This massa branca, is the matrix in which the topaz is imbedded, like a nodule of flint in a lump of chalk.

"Here a number of negroes, with rude knives like peices of iron hoop, were scarifying the ground. When they cut across a white vein, it immediately became visible, and they pursued it, dislodging the topazes which were bedded inside, and handing them to an overseer with a bag."—Vol. ii. ch. 7.

"In the course of my journey I passed over six different surfaces, strikingly distinguished from each other in their aspect, formation, and productions. The first was the Beiramar, the rich plain which extended from the edge of the sea, to the base of the great serra, generally about sixty miles in breadth. This is, with some exceptions, a flat surface, with an alluvial or sandy soil,

exceedingly fertile, covered with fazendas, (farms,) and generally well cultivated.

"The next diversity of country was the Serra Acima, the great ridges of clay covered with immense forests of timber. A considerable part of these seem to consist of mounds of earth without any admixture of rock. We saw, in some places, deep sections of the hills, where either a part had fallen away, or it had been cut down. They presented perpendicular faces of earth, some of them near a hundred feet deep, into which the roots of lofty trees had penetrated to an incredible depth, almost realizing the poet's description, that they had extended as far below, as the branches above the surface of the soil. In many of these vast heaps of clay, we could not detect a stone as large as a boy's marble.

"The next variety of surface presented to us was the rocky serras, which rose like huge walls from the surface of the plains, bearing in their bosoms the metalliferous veins, and impregnating all the soil at their bases with the particles of precious ore washed down them. The features of this region were very extraordinary, and had no kind of affinity with the former two. The summits of these naked stony ridges were often surmounted by fantastic protuberances, which the inhabitants imagined had human resemblances. One was called Ita Columi, or the child of stone; and another, Serra da Cava, from its likeness to an enormous visage. From this stony Arabia, we entered into the mato or thicket; low eminences, covered over with copse and brushwood, frequently interspersed with ferns and brambles, resembling similar soil and aspect, in the middle regions of Europe.

Finally, we passed between bristly pikes, and conical mountains of bare granite, ascending to the sky, with well defined forms, and smooth taper surfaces, not having the most distant resemblance to any other objects we had passed."—Vol. 2. ch. 12.

We hope soon to lay a very interesting account before our readers of the now celebrated gold region, in the southern parts of the United States. With some irrelevant exceptions, the Rev'd. Mr. Walsh's able account of the gold country in Brazil, would be an exact mineralogical description of some of the veins in North Carolina. We were exceedingly struck with this resemblance.—EDITOR.

NOTES ON ILLINOIS.

Our readers, we think, cannot but be pleased with the extract we are about to present them with, from the Illinois Monthly Magazine, for July, 1831. A work so much devoted to the natural history, the manners, customs, and literature of 'the far west,' carries an intrinsic value with it, that will soon be generally appreciated. It speaks volumes for the intelligence of the inhabitants of the western states, that a work so truly American, and so meritoriously conducted, should have appeared amongst them.—ED.

WILD ANIMALS.

The buffaloe has entirely left us. Before the country was settled, our immense prairies afforded pasturage to large herds of this animal, and the traces of them are still remaining, in the "buffaloe paths" which are to be seen in several parts of the state. These are well beaten tracks, leading

generally from the prairies in the interior of the state, to the margins of the large rivers; showing the course of their migrations as they changed their pastures periodically, from the low marshy alluvion, to the dry upland plains. In the heat of summer they would be driven from the latter by prairie flies, in the autumn they would be expelled from the former by the musquitoes; in the spring the grass of the plains would afford abundant pasturage, while the herds could enjoy the warmth of the sun, and snuff the breeze that sweeps so freely over them; in the winter the rich cane of the river banks, which is an evergreen, would furnish food, while the low grounds, thickly covered with brush and forest, would afford protection from the bleak winds. I know few subjects more interesting than the migration of wild animals, connecting, as it does, the singular displays of brute instinct, with a wonderful exhibition of the various supplies which nature has provided for the support of animal life, under an endless variety of circumstances. These paths are narrow, and remarkably direct, showing that the animals travelled in single file through the woods, and pursued the most direct course to their places of destination.

Deer are more abundant than at the first settlement of the country. They increase, to a certain extent, with the population. The reason of this appears to be, that they find protection in the neighbourhood of man, from the beasts of prey that assail them in the wilderness, and from whose attacks their young, particularly, can with difficulty escape. They suffer most from the wolves, who hunt in packs like hounds, and who seldom give up the chase until a deer is taken. We have often sat, on a moonlight summer night, at the door of a log cabin on one of our prairies, and heard the wolves in full chase of a deer, yelling very nearly in the same manner as a pack of hounds. Sometimes the cry would be heard at a great distance over the plain; then it would die away, and again be distinguished at a nearer point, and in another direction—now the full cry would burst upon us from a neighbouring thicket, and we could almost hear the sobs of the exhausted deer; and again it would be borne away and lost in distance. We have passed nearly whole nights in listening to such sounds; and once we saw a deer dash through the yard, and immediately past the door at which we sate, followed by his audacious pursuers, who were but a few yards in his rear.

Immense numbers of deer are killed every year by our hunters, who take them for their hams and skins alone, throwing away the rest of the carcass. Venison hams and hides are important articles of export. The former are purchased from the hunters at 25 cents a pair, the latter at 20 cents a pound. In our villages we purchase, for our tables, the saddle of venison with the hams attached, for 37½ cents, which would be something like one cent a pound.

There are several ways of hunting deer, all of which are equally simple. Most generally the hunter proceeds to the woods on horseback, in the day time, selecting particularly certain hours, which are thought to be most favourable. It is said that during the seasons when the pastures are green, this animal rises from his lair, precisely at the rising of the moon, whether in the day or night; and I suppose the fact to be so, because such is the testimony of experienced hunters. If it be true, it is certainly a curious display of animal instinct. This hour therefore is always kept in view by the hunter, as he rides slowly through the forest, with his rifle on his shoulder, while his keen eye penetrates the surrounding shades. On beholding a deer the hunter slides from his horse, and while the deer is observing the latter, creeps upon him, keeping the largest trees between himself and the object of pursuit, until he gets near enough to fire. An expert woodsman seldom fails to hit his game. It is extremely dangerous to approach a wounded deer. Timid and harmless as this animal is at other times, he no sooner finds himself deprived of the power of flight than he

becomes furious, and rushes upon his enemy, making desperate plunges with his sharp horns, and striking and trampling violently with his fore legs, which being extremely muscular, and armed with sharp hoofs, are capable of inflicting very severe wounds. Aware of this circumstance, the hunter approaches him with caution, and either secures his prey by a second shot, where the first has been but partially successful, or, as is more frequently the case, causes his dog to seize the wounded animal, while he watches his own opportunity to stab him with his hunting knife. Sometimes where a noble buck is the victim, and the hunter is impatient or inexperienced, terrible conflicts ensue on such occasions.

Another mode, is to watch at night, in the neighbourhood of the *salt licks.* These are spots where the earth is impregnated with saline particles, or where the salt water oozes through the soil. Deer and other grazing animals frequent such places, and remain for hours licking the earth. The hunter secretes himself here, either in the thick top of a tree, or most generally in a screen erected for the purpose, and artfully concealed like a masked battery, with logs or green boughs. This practice is pursued only in the summer, or early in the autumn, in cloudless nights, when the moon shines brilliantly, and objects may be readily discovered. At the rising of the moon or shortly after, the deer having risen from their beds, approach the lick. Such places are generally denuded of timber, but surrounded by it; and as the animal is about to emerge from the shade into the clear moonlight, he stops, looks cautiously around, and snuffs the air. Then he advances a few steps, and stops again, smells the ground, or raises his expanded nostrils, as if he "snuffed the approach of danger in every tainted breeze." The hunter sits motionless, and almost breathless, waiting until the animal shall get within rifle shot, and until its position in relation to the hunter, and the light, shall be favourable, when he fires with an unerring aim. A few deer only can be thus taken in one night, and after a few nights these timorous animals are driven from the haunts which are thus disturbed.

Another practice is called *driving*, and is only practised in those parts of the country where this kind of game is scarce, and where hunting is pursued as an amusement. A large party is made up, and the hunters ride forth with their dogs. The hunting ground is selected, and as it is pretty well known what tracks are usually taken by the deer when started, an individual is placed at each of those passes, to intercept the retreating animal. The scene of action being thus, in some measure, surrounded, small parties advance with the dogs from different directions, and the startled deer, in flying, most generally pass some of the persons who are concealed, and who fire at them as they pass.

The elk, has disappeared. A few have been seen in late years, and some taken; but it is not known that any remain at this time, within the limits of the state.

The bear is seldom seen. This animal inhabits those parts of the country that are thickly wooded, and delights particularly in cane brakes, where it feeds in the winter on the tender shoots of the young cane. The meat is tender and finely flavoured, and is esteemed a great delicacy.

Wolves are very numerous in every part of the state. There are two kinds: the common, or black wolf, and the prairie wolf. The former is a large fierce animal, and very destructive to sheep, pigs, calves, poultry, and even young colts. They hunt in large packs, and after using every stratagem to circumvent their prey, attack it with remarkable ferocity. Like the Indian, they always endeavour to surprise their victim, and strike the mortal blow without exposing themselves to danger. They seldom attack man, except when asleep or wounded. The largest animals, when wounded, entangled, or otherwise disabled, become their prey, but in general they only attack such as are incapable of resistance. They have been known to lie in wait upon the bank of a stream which the buffaloes were in the habit

of crossing, and when one of those unwieldy animals was so unfortunate as to sink in the mire, spring suddenly upon it, and worry it to death, while thus disabled from resistance. Their most common prey is the deer, which they hunt regularly; but all defenceless animals are alike acceptable to their ravenous appetites. When tempted by hunger they approach the farm houses in the night, and snatch their prey from under the very eye of the farmer; and when the latter is absent with his dogs, the wolf is sometimes seen by the females lurking about in mid-day, as if aware of the unprotected state of the family. Our heroic females have sometimes shot them under such circumstances.

The smell of burning assafœtida has a remarkable effect upon this animal. If a fire be made in the woods, and a portion of this drug thrown into it, so as to saturate the atmosphere with the odour, the wolves, if any are within reach of the scent, immediately assemble around, howling in the most mournful manner; and such is the remarkable fascination under which they seem to labour, that they will often suffer themselves to be shot down rather than quit the spot.

Of the very few instances of their attacking human beings, of which we have heard, the following may serve to give some idea of their habits. In very early times, a negro man was passing in the night, in the lower part of Kentucky, from one settlement to another. The distance was several miles, and the country over which he travelled entirely unsettled. In the morning his carcass was found entirely stripped of flesh. Near it lay his axe, covered with blood, and all around the bushes were beaten down, the ground trodden, and the number of foot tracks so great, as to show that the unfortunate victim had fought long and manfully. On pursuing his track it appeared that the wolves had pursued him for a considerable distance, he had often turned upon them and driven them back. Several times they had attacked him, and been repelled, as appeared by the blood and tracks. He had killed some of them, before the final onset, and in the last conflict had destroyed several. His axe was his only weapon.

On another occasion, many years ago, a negro man, was going through the woods, with no companion but his fiddle, when he discovered that a pack of wolves were on his track. They pursued very cautiously, but a few of them would sometimes dash up, and growl, as if impatient for their prey, and then fall back again. As he had several miles to go, he became much alarmed. He sometimes stopped, shouted, drove back his pursuers, and then proceeded. The animals became more and more audacious, and would probably have attacked him, had he not arrived at a deserted cabin, which stood by the way side. Into this he rushed for shelter, and without waiting to shut the door, climbed up and seated himself on the rafters. The wolves dashed in after him, and becoming quite furious, howled, and leaped, and endeavoured with every expression of rage to get to him. The moon was now shining brightly, and Cuff being able to see his enemies, and satisfied of his own safety, began to act on the offensive. Finding the cabin full of them, he crawled down to the top of the door, which he shut and fastened. Then removing some of the loose boards from the roof, scattered them with a tremendous clatter upon such of his foes as remained outside, who soon scampered off, while those in the house began to crouch with fear. He had now a large number of prisoners to stand guard over, until morning; and drawing forth his fiddle, he very good naturedly played for them all night, very much, as he supposed, to their edification and amusement, for like all genuine lovers of music, he imagined that it had power to soften the heart, even of a wolf. On the ensuing day, some of the neighbours assembled and destroyed the captives, with great rejoicings.

The prairie wolf, is a smaller species, which takes its name from its habit of residing entirely upon the open plains. Even when hunted with dogs, it

will make circuit after circuit, round the prairie, carefully avoiding the forest, or only dashing into it occasionally when hard pressed, and then returning to the plain. In size and appearance, this animal is midway between the wolf and the fox, and in colour it resembles the latter, being of a very light red. It preys upon poultry, rabbits, young pigs, calves, &c. The most friendly relations subsist between this animal and the common wolf, and they constantly hunt in packs together. Nothing is more common than to see a large black wolf, in company with several prairie wolves. I am well satisfied that the latter is the jackal of Asia.

Several years ago an agricultural society, which was established at the seat of government, offered a large premium to the person who should kill the greatest number of wolves in one year. The legislature at the same time offered a bounty for each wolf scalp that should be taken. The consequence was, that the expenditure for wolf scalps became so great, as to render it necessary to repeal the law. These animals, although still numerous, and troublesome to the farmer, are greatly decreased in number, and are no longer dangerous to man. We know of no instances in late years, of a human being having been attacked by them.

We have the fox, in some places in great numbers; though generally speaking, I think the animal is scarce. It will undoubtedly increase with the population.

The panther and wild-cat are found in our forests. Our open country is not, however, well suited to their shy habits, and they are less frequently seen than in some of the neighbouring states.

The beaver and otter, were once numerous, but are now seldom seen except on our frontiers.

The gopher,* is, as we suppose, a non descript. The name does not occur in books of natural history, nor do we find any animal of a corresponding description. The only account that we have seen of it, is in " Long's Second Expedition." In a residence in this state of eleven years, we have never seen one, nor have we ever conversed with a person who has seen one—we mean, who has seen one near enough to examine it, and to be certain that it was not something else. That such an animal exists is doubtless; but they are very shy and their numbers small. They burrow in the earth, and are supposed to throw up those hillocks which are seen in such vast abundance over our prairies. This is to some extent a mistake, for we know that many of these little mounds are thrown up by craw-fish, and by ants.

The polecat is very destructive to our poultry.

The raccoon and opossum are very numerous, and extremely troublesome to the farmer, as they not only attack his poultry, but plunder his cornfields. They are hunted by boys, and large numbers of them destroyed. The skins of the raccoons pay well for the trouble of taking them, as the fur is in demand.

Rabbits are very abundant, and in some places extremely destructive to the young orchards, and to garden vegetables.

We have the large grey squirrel, and the ground squirrel.

There are no rats, except along the large rivers, where they have landed from the boats.

* The writer of this interesting article, appears not to be aware that the *Gopher* has already been described. It belongs to the class Mammalia, order Rodentia. It was formerly included in the genus Mus, of Linnæus, but Rafinesque has given it the elegant name of 'Geomys.' It is the 'Pseudostoma' of Say, and the Mus Bursarius of Shaw. There is but one species yet known, the *Geomys Bursarius*, or *Earth Rat with Pouches*. It is the size of a rat, of a reddish grey colour, has deep cheek pouches, which open externally, enlarging the sides of the head and neck. When it was first figured in the Transactions of the Linnæan Society, and in Shaw, vol. 2, part 1, these pouches were represented turned inside out, as though it had a bag on each side of the head.—Ed.

SCIENTIFIC MEMORANDA.

Herds of frozen Elephants, Rhinoceros, &c. &c.—In No. VII. of "Bulletin de la Societe Imperiale des Naturalistes de Moscou," there is a letter from M. Hedenstrom, to whom the Russian government had intrusted an expedition for the purpose of tracing geometrically the coasts of the Icy sea, from Lena to Colyma, and of making a description of the isles of the north. He was three years in these remarkable countries, and discovered a new Island, which he named *New Siberia*, because its general appearance is much more savage than that of the old Siberia. In the unchangeable icy crusts of these countries there were found buried thousands of the mammout, (commonly called mammoth,) rhinoceros, buffaloe, and other antediluvian animals. New Siberia is indeed a country full of wonders, but which naturalists can only admire, for it is impossible to study nature there. The ground, frozen and hard as the rock, cannot be dug into; and the summer is too short for the necessary researches.

Mag. of Nat. His. May, 1831, *page* 253.

Voice of Fishes.—It appears that fishes, like many diffident young persons, "don't sing, but will try to do their best." In Loudon's Magazine of Natural History, it is stated by a Mr. Thompson, that "some tench, which I caught in ponds, made a croaking like a frog, for a full half hour, whilst in the basket at my shoulder." Mr. Murray also observes, "when the herring is just caught in the net, and brought into the boat, it utters a shrill cry like the mouse; and I have often heard the long continued 'grunting' or croaking, of the gurnard, after being freed from the hook."

Easy method of destroying Insects, intended for cabinet specimens.—Put a quantity of sal. volatile, or common smelling salts, into a wide mouthed bottle; the insects will die soon after being introduced into it. For the larger moths, it is recommended, first to make a solution of crystallized oxalic acid with a little water; then holding the moth gently on the under side, between the wings, with the finger and thumb of your left hand, dip a sharp pointed quill, without a split, in the solution, run it into the insect between the first pair of legs, and after one or two applications, the moth will be dead.

Elevation of the Morea.—A paper by M. Boblaye, on the geology of the Morea and Egina, offers proofs of the country having been upraised, not by degrees, but by intervals, so sudden, that the land abandoned by the sea, is now in distinct irregular terraces.—*Acad. des Sciences.*

A new Skeleton of the Megatherium.—A perfect skeleton of this rare animal, exceeding in size the splendid specimen preserved in the cabinet of Natural History, in Madrid, has been lately discovered, one hundred and twenty-six miles south of Buenos Ayres. This remarkable specimen of antediluvian* zoology, is now in the possession of Woodbine Parish, Esq. Consul General at Buenos Ayres, who intends to bring it with him to Europe.—*Jameson's Ed. N. P. Journal.*

Geology of India.—Dr. Turnbull Christie, has been appointed to examine the geology of the presidency of Madras. He visits Egypt and Syria on his way, accompanied by an artist to make designs of the various objects in natural history; and carries with him the proper instruments to examine meteorological, and hydrographical phenomena.—*Ibid.*

* We want the evidence of its being antediluvian.—Ed.

TO READERS AND CORRESPONDENTS.

We have received the various communications of 'Crito.' 'R.' 'A Marylander.' 'A student in Geology.' There are also some papers lying on our table without any signature or reference whatever. Our correspondents would find a convenience in affixing some designation to their papers. We wish them to understand, that when it is not expedient to publish a paper, we are desirous of transmitting it to the writer without delay.—Of a paper thus circumstanced, we desire to observe, that we are sensible of the friendly intentions of the writer, that it is well and forcibly written, and has amused us exceedingly; but we must decline the publication of it, at any rate at present. Having taken our full satisfaction, we have not the least desire of returning to a disagreeable subject. We hope henceforward to be permitted to pursue our path in cheerfulness and peace, and shall hold the communication of an unknown friend subject to his instructions.

To 'a student in geology,' we desire to say, that we have not forgotten our pledge to give 'in each number a continuous essay on geology as a science.' By recurring to page 4, of our first number, he will perceive what our intentions are; and that we have been constantly engaged in the execution of them. The 'Epitome of the Progress of Natural Science,' will terminate with the number for November; the rise of the physical sciences and of geology will be then treated of. We shall hereafter come forward, hammer in hand, and endeavour to explain in a transparent manner, the true principles of geology and the general philosophy of natural science. We hope that the earnest we shall give of our sincere desire to advance the knowledge of American geology, will induce many to come to our aid. The developement of the geology of this vast continent, can only be effected by the labours of concurring observers. Whenever they are submitted to us, our correspondents may feel assured, that upon all occasions, they shall not only receive the most ample credit for their contributions, but the assistance of our deliberate judgment. We propose ere long to return to this subject, with a view of pointing out the most expedient manner of effecting so desirable an end.